

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

United States Patent and Trademark  
Office  
(Box PCT)  
Crystal Plaza 2  
Washington, DC 20231  
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

<b>Date of mailing</b> (day/month/year) 03 June 1999 (03.06.99)	
<b>International application No.</b> PCT/AU98/00855	<b>Applicant's or agent's file reference</b> 2112340/MLA
<b>International filing date</b> (day/month/year) 14 October 1998 (14.10.98)	<b>Priority date</b> (day/month/year) 14 October 1997 (14.10.97)
<b>Applicant</b> KIRBY, Andrew, Francis et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

14 May 1999 (14.05.99)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<b>The International Bureau of WIPO</b> 34, chemin des Colombettes 1211 Geneva 20, Switzerland	<b>Authorized officer</b> Lazar Joseph Panakal
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

## PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

ANGLISS, Michael, L.  
Davies Collison Cave  
1 Little Collins Street  
Melbourne, VIC 3000  
AUSTRALIE

<b>Date of mailing</b> (day/month/year) 22 April 1999 (22.04.99)	<b>IMPORTANT NOTIFICATION</b>
<b>Applicant's or agent's file reference</b> 2112340/MLA	
<b>International application No.</b> PCT/AU98/00855	<b>International filing date</b> (day/month/year) 14 October 1998 (14.10.98)

1. The following indications appeared on record concerning:		
<input checked="" type="checkbox"/> the applicant	<input type="checkbox"/> the inventor	<input type="checkbox"/> the agent
<input type="checkbox"/> the common representative		
<b>Name and Address</b> ORICA AUSTRALIA PTY LTD 1 Nicholson Street Melbourne, VIC 3000 Australia	<b>State of Nationality</b> AU	<b>State of Residence</b> AU
	<b>Telephone No.</b>	
	<b>Facsimile No.</b>	
	<b>Teleprinter No.</b>	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:		
<input checked="" type="checkbox"/> the person	<input checked="" type="checkbox"/> the name	<input checked="" type="checkbox"/> the address
<input checked="" type="checkbox"/> the nationality	<input checked="" type="checkbox"/> the residence	
<b>Name and Address</b> HUNTSMAN SURFACTANTS TECHNOLOGY CORPORATION 500 Huntsman Way Salt Lake City, UT 84108-1235 United States of America	<b>State of Nationality</b> US	<b>State of Residence</b> US
	<b>Telephone No.</b>	
	<b>Facsimile No.</b>	
	<b>Teleprinter No.</b>	
3. Further observations, if necessary: <b>A Power of Attorney executed by the new applicant is required.</b>		
4. A copy of this notification has been sent to:		
<input checked="" type="checkbox"/> the receiving Office	<input checked="" type="checkbox"/> the designated Offices concerned	
<input checked="" type="checkbox"/> the International Searching Authority	<input type="checkbox"/> the elected Offices concerned	
<input type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:	

<b>The International Bureau of WIPO</b> 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	<b>Authorized officer</b>  Dominique DELMAS  Telephone No.: (41-22) 338.83.38
--	---

REC'D 14 FEB 2000

Applicant's or agent's file reference 2112340/MJC/RR	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).	
International application No. <b>PCT/AU 98/00855</b>	International filing date (day/month/year) 14 October 1998	Priority Date (day/month/year) 14 October 1997
International Patent Classification (IPC) or national classification and IPC  <b>Int. Cl.<sup>7</sup> A01N 25/30; B01F 17/52</b>		
Applicant <b>HUNTSMAN SURFACTANTS TECHNOLOGY CORPORATION</b>		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.  
☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of <sup>38<sup>A</sup></sup>~~35~~ sheet(s).

## 3. This report contains indications relating to the following items:

- |      |                                     |   |
|------|-------------------------------------|---|
| I    | <input checked="" type="checkbox"/> | Basis of the report   |
| II   | <input type="checkbox"/>            | Priority  |
| III  | <input checked="" type="checkbox"/> | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| IV   | <input type="checkbox"/>            | Lack of unity of invention  |
| V    | <input checked="" type="checkbox"/> | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| VI   | <input type="checkbox"/>            | Certain documents cited   |
| VII  | <input type="checkbox"/>            | Certain defects in the international application  |
| VIII | <input checked="" type="checkbox"/> | Certain observations on the international application   |

Date of submission of the demand 14 May 1999	Date of completion of the report 1 February 2000
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer  <b>GAYE HOROBIN</b> Telephone No. (02) 6283 2069

**I Basis of the report****1. With regard to the elements of the international application:\***☐ the international application as originally filed.☒ the description, pages 1-11, 13, 19-28, 30, 31, 34-41, as originally filed,  
pages , filed with the demand,  
pages 12, 14-18, 29, 32, 33, filed with the letter of 2 September 1999 .☒ the claims, pages , as originally filed,  
pages , as amended (together with any statement) under Article 19,  
pages , filed with the demand,  
pages 42-70 , filed with the letter of 2 September 1999.☐ the drawings, pages , as originally filed,  
pages , filed with the demand,  
pages , filed with the letter of .☐ the sequence listing part of the description:  
pages , as originally filed  
pages , filed with the demand  
pages , filed with the letter of .**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, was on the basis of the sequence listing:**☐ contained in the international application in written form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished**4. The amendments have resulted in the cancellation of:**☐ the description, pages☐ the claims, Nos.☐ the drawings, sheets/fig.**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

**III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be nonobvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos.: 15, 25, 46 and 63

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 15, 25, 46, 63 are so unclear that no meaningful opinion could be formed (*specify*):

In claims 15, 25, 46 and 61, Formula I "R<sub>3</sub>" has not been defined, nor has it been defined in the corresponding sections of the description. These claims are thus too imprecise for any meaningful opinion to be formed.

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☒ no international search report has been established for said claim Nos. 15, 25, 46, 63

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims 1-4,6-17,21-23,27-33,35,36,38,39,42-45,50-54,57-62,64	YES
	Claims 5,18-20,24,26,34,37,40,41,47-49,55,56	NO
Inventive step (IS)	Claims 1-4,6-17,21-23,27-33,35,36,38,39,42-45,50-54,57,62,64	YES
	Claims 5,18-20,24,26,34,37,40,41,47-49,55,56	NO
Industrial applicability (IA)	Claims 1-14,16-24,26-45,47-62,64	YES
	Claims	NO

**2. Citations and explanations (Rule 70.7)****NOVELTY(N) Claims 5,18-20,24,26,34,37,40,41,47-49,55,56**

D1 Patent Abstracts of Japan JP 58-131903

D2 Derwent Abstract Accession No.87-084153/12 of JP 62-036302

D3 FR 2545325

D1 discloses a granular agricultural chemical composition comprising a water soluble salt of a sulfonated mono-olefin-ethylenic unsaturated dicarboxylic acid copolymer resin. The abstract discloses specifically a sulfonated styrene-maleic anhydride copolymer resin and a sulfonated isobutylene maleic anhydride copolymer resin. The composition is prepared in the form of wettable granules. Claims 18, 19, 20, 24, 26, 34, 37, 40, 41, 5, 47, 48, 49, 55 and 56 are not novel when compared to this document.

D2 discloses granular wettable agricultural compositions containing a polycarboxylic acid type surfactant. The surfactants include copolymers of maleic acid and diisobutylene. This copolymer clearly falls within those defined in claim 5 and it is common knowledge that the agricultural composition would be applied to a substrate when it is used. Claim 5 therefore lacks novelty when compared with this document.

D3 discloses a granular composition of agriculturally active compounds, such as insecticides, acaricides, fungicides, herbicides and repellents, containing a copolymeric dispersant. This dispersant is a copolymer of maleic anhydride and diisobutylene. This copolymer clearly falls within the scope of those defined in claim 5. It is further disclosed that the granules are mixed with water to form a dispersion which is applied to an agricultural substrate. Claim 5 lacks novelty when compared to this disclosure.

**INVENTIVE STEP(IS) Claims 5,18-20,24,26,34,37,40,41,47-49,55,56**

As above

**New Citations**

Derwent Abstract Accession No. 87-084153/12, Class A97, C03, JP 62-036302 A (KUMIAI\_CHEM IND KK)  
17 February 1987

FR 2545325 A (SEDAGRI) 9 November 1984

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

The description lacks clarity because the moiety "R<sub>3</sub>" in Formula I at page 14 has not been identified.

Claims 15, 25, 46 and 63 lack clarity because the moiety "R<sub>3</sub>" in formula I has not been defined. These issues were raised in Box III of the first opinion but have not yet been addressed.

Claim 1 lacks clarity in that it refers to  $\beta$ -pipene when the rest of the document refers to  $\beta$ -pinene.

Claim 1 lacks clarity in that it refers to methylene cyclopentene when the rest of the document refers to methylene cyclopentane.

# PATENT COOPERATION TREATY

From the:  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

FR 1000 FEB 2000

To:

Davies Collison Cave  
1 Little Collins Street  
MELBOURNE VIC 3000

## PCT NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

MSC

Date of mailing  
day/month/year

03 FEB 2000

Applicant's or agent's file reference  
2112340/MJC/RR

### IMPORTANT NOTIFICATION

International application No.  
**PCT/AU 98/00855**

International filing date  
14 October 1998

Priority date  
14 October 1997

Applicant

**HUNTSMAN SURFACTANTS TECHNOLOGY CORPORATION**

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translations to those Offices.

#### 4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide

Name and mailing address of the IPEA/AU

AUSTRALIAN PATENT OFFICE  
PO BOX 200, WODEN ACT 2606, AUSTRALIA  
E-mail address: pct@ipaustalia.gov.au  
Facsimile No. (02) 6285 3929

Authorized officer

**GAYE HOROBIN**

Telephone No. (02) 6283 2069



**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY EXAMINATION REPORT**  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2112340/MJC/RR	<b>FOR FURTHER ACTION</b>	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International application No. <b>PCT/AU 98/00855</b>	International filing date ( <i>day/month/year</i> ) 14 October 1998	Priority Date ( <i>day/month/year</i> ) 14 October 1997
International Patent Classification (IPC) or national classification and IPC  <b>Int. Cl.<sup>7</sup> A01N 25/30; B01F 17/52</b>		
Applicant <b>HUNTSMAN SURFACTANTS TECHNOLOGY CORPORATION</b>		

1.	This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.																								
2.	This REPORT consists of a total of 5 sheets, including this cover sheet.  <input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  These annexes consist of a total of 35 sheet(s).																								
3. This report contains indications relating to the following items: <table style="width: 100%; border: none;"> <tr> <td style="width: 5%;">I</td> <td style="width: 5%; text-align: center;"><input checked="" type="checkbox"/></td> <td>Basis of the report</td> </tr> <tr> <td>II</td> <td style="text-align: center;"><input type="checkbox"/></td> <td>Priority</td> </tr> <tr> <td>III</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td>IV</td> <td style="text-align: center;"><input type="checkbox"/></td> <td>Lack of unity of invention</td> </tr> <tr> <td>V</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td>VI</td> <td style="text-align: center;"><input type="checkbox"/></td> <td>Certain documents cited</td> </tr> <tr> <td>VII</td> <td style="text-align: center;"><input type="checkbox"/></td> <td>Certain defects in the international application</td> </tr> <tr> <td>VIII</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Certain observations on the international application</td> </tr> </table>		I	<input checked="" type="checkbox"/>	Basis of the report	II	<input type="checkbox"/>	Priority	III	<input checked="" type="checkbox"/>	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	IV	<input type="checkbox"/>	Lack of unity of invention	V	<input checked="" type="checkbox"/>	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	VI	<input type="checkbox"/>	Certain documents cited	VII	<input type="checkbox"/>	Certain defects in the international application	VIII	<input checked="" type="checkbox"/>	Certain observations on the international application
I	<input checked="" type="checkbox"/>	Basis of the report																							
II	<input type="checkbox"/>	Priority																							
III	<input checked="" type="checkbox"/>	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability																							
IV	<input type="checkbox"/>	Lack of unity of invention																							
V	<input checked="" type="checkbox"/>	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement																							
VI	<input type="checkbox"/>	Certain documents cited																							
VII	<input type="checkbox"/>	Certain defects in the international application																							
VIII	<input checked="" type="checkbox"/>	Certain observations on the international application																							

Date of submission of the demand 14 May 1999	Date of completion of the report 1 February 2000
Name and mailing address of the IPEA/AU  AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer  <b>GAYE HOROBIN</b>  Telephone No. (02) 6283 2069

**I. Basis of the report****1. With regard to the elements of the international application:\***☐ the international application as originally filed.☒ the description, pages 1-11, 13, 19-28, 30, 31, 34-41, as originally filed,  
pages , filed with the demand,  
pages 12, 14-18, 29, 32, 33, filed with the letter of 2 September 1999 .☒ the claims, pages , as originally filed,  
pages , as amended (together with any statement) under Article 19,  
pages , filed with the demand,  
pages 42-70 , filed with the letter of 2 September 1999.☐ the drawings, pages , as originally filed,  
pages , filed with the demand,  
pages , filed with the letter of .☐ the sequence listing part of the description:  
pages , as originally filed  
pages , filed with the demand  
pages , filed with the letter of .**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, was on the basis of the sequence listing:**☐ contained in the international application in written form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished**4. ☐ The amendments have resulted in the cancellation of:**☐ the description, pages☐ the claims, Nos.☐ the drawings, sheets/fig.**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

**III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be nonobvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos.: 15, 25, 46 and 63

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 15, 25, 46, 63 are so unclear that no meaningful opinion could be formed (*specify*):

In claims 15, 25, 46 and 61, Formula I "R<sub>3</sub>" has not been defined, nor has it been defined in the corresponding sections of the description. These claims are thus too imprecise for any meaningful opinion to be formed.

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☒ no international search report has been established for said claim Nos. 15, 25, 46, 63

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Claims 1-4,6-17,21-23,27-33,35,36,38,39,42-45,50-54,57-62,64	YES
	Claims 5,18-20,24,26,34,37,40,41,47-49,55,56	NO
Inventive step (IS)	Claims 1-4,6-17,21-23,27-33,35,36,38,39,42-45,50-54,57,62,64	YES
	Claims 5,18-20,24,26,34,37,40,41,47-49,55,56	NO
Industrial applicability (IA)	Claims 1-14,16-24,26-45,47-62,64	YES
	Claims	NO

**2. Citations and explanations (Rule 70.7)**

**NOVELTY(N) Claims 5,18-20,24,26,34,37,40,41,47-49,55,56**

- D1 Patent Abstracts of Japan JP 58-131903  
 D2 Derwent Abstract Accession No.87-084153/12 of JP 62-036302  
 D3 FR 2545325

D1 discloses a granular agricultural chemical composition comprising a water soluble salt of a sulfonated mono-olefin-ethylenic unsaturated dicarboxylic acid copolymer resin. The abstract discloses specifically a sulfonated styrene-maleic anhydride copolymer resin and a sulfonated isobutylene maleic anhydride copolymer resin. The composition is prepared in the form of wettable granules. Claims 18, 19, 20, 24, 26, 34, 37, 40, 41, 5, 47, 48, 49, 55 and 56 are not novel when compared to this document.

D2 discloses granular wettable agricultural compositions containing a polycarboxylic acid type surfactant. The surfactants include copolymers of maleic acid and diisobutylene. This copolymer clearly falls within those defined in claim 5 and it is common knowledge that the agricultural composition would be applied to a substrate when it is used. Claim 5 therefore lacks novelty when compared with this document.

D3 discloses a granular composition of agriculturally active compounds, such as insecticides, acaricides, fungicides, herbicides and repellents, containing a copolymeric dispersant. This dispersant is a copolymer of maleic anhydride and diisobutylene. This copolymer clearly falls within the scope of those defined in claim 5. It is further disclosed that the granules are mixed with water to form a dispersion which is applied to an agricultural substrate. Claim 5 lacks novelty when compared to this disclosure.

**INVENTIVE STEP(IS) Claims 5,18-20,24,26,34,37,40,41,47-49,55,56**

As above

**New Citations**

Derwent Abstract Accession No. 87-084153/12, Class A97, C03, JP 62-036302 A (KUMIAI CHEM IND KK)  
 17 February 1987  
 FR 2545325 A (SEDAGRI) 9 November 1984

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

The description lacks clarity because the moiety "R<sub>3</sub>" in Formula I at page 14 has not been identified.

Claims 15, 25, 46 and 63 lack clarity because the moiety "R<sub>3</sub>" in formula I has not been defined. These issues were raised in Box III of the first opinion but have not yet been addressed.

Claim 1 lacks clarity in that it refers to  $\beta$ -pipene when the rest of the document refers to  $\beta$ -pinene.

Claim 1 lacks clarity in that it refers to methylene cyclopentene when the rest of the document refers to methylene cyclopentane.

- 12 -

invention include fumaric acid, maleic acid and anhydrides, and the esters, amides and imides derived from them, itaconic acid and anhydride and the corresponding esters amides and imides derived from them, acrylic and methacrylic acids, esters and amides, vinylphosphonic acid and the corresponding esters and amides derived from it and ethylene sulphonic acid and  
5 the esters and amides derived from it.

The second comonomer for use in the present invention is an olefin having at least one polymerizable double bond which may be substituted as defined herein.

10 The second comonomer for use in the second embodiment of the present invention may be an alicyclic monomer having a polymerizable exo-cyclic double bond. It will be understood that by alicyclic monomer is meant an aliphatic cyclic monomer containing moieties such as a cyclic alkyl, cyclic alkenyl or heterocyclic groups and which may comprise one or more carbocyclic or heterocyclic rings. It will be understood that by exo-cyclic is meant an  
15 alkylidene substituted cyclic structure. Alicyclic monomers having a polymerizable exo-cyclic double bond may optionally be substituted. Alicyclic monomers having a polymerizable exo-cyclic double bond of the present invention may include, for example,  $\beta$ -pinene, 5-ethylidene-2-norbornene, methylene cyclohexane and methylene cyclopentane. The most preferred alicyclic monomer having a polymerizable exo-cyclic double bond.

20

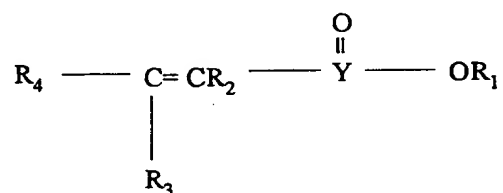
The second comonomer for use in the second embodiment of the present invention may be an alicyclic monomer having a polymerizable endo-cyclic double bond. The term alicyclic

-14-

allyglycidylether of vinylisobutylether. The second comonomer may also be an internal olefin.

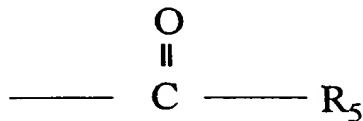
Preferred examples of the first comonomer may be described as having structure I

5



I

wherein  $\text{R}_1$  is M a metal, quaternary ammonium, phosphonium or sulphonium residue,  $\text{R}_2$  is hydrogen or  $\text{C}_1$  to  $\text{C}_4$  alkyl is a carbon atom, Y is a carbon O=S, or  $\text{POR}_1$  a hydrogen atom  
 10 or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical) and  $\text{R}_4$  is H, an alkyl radical or a carboxylic acid derivative of form II

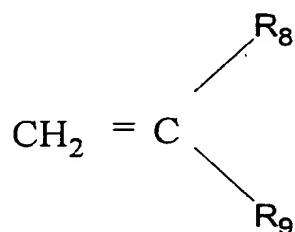


II

15 wherein  $\text{R}_5$  is  $\text{OR}_6$ ,  $\text{NR}_6\text{R}_7$ ,  $\text{SR}_6$ ,

- 15 -

wherein  $R_6, R_7$ , are H, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent. The second comonomer may be alternatively described as a residue having formula III



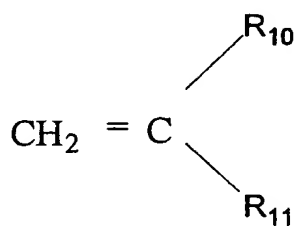
5

**III**

wherein  $R_8$  represents hydrogen, a straight or branched chain alkyl of from 1-4 carbon atoms,  $R_9$  represents hydrogen, a branched chain alkyl radical from 1-12 carbon atoms, or cycloalkyl radical,

and/or a vinyl compound of formula IV

10

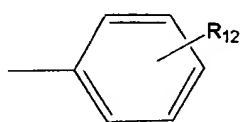
**IV**



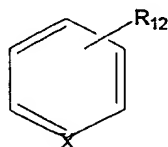
- 16 -

wherein  $R_{10}$  is a straight or branched chain alkyl radical of from 1-4 carbons and  $R_{11}$  is given by formula V, VI or VII,

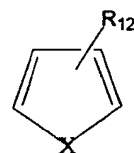
5



V



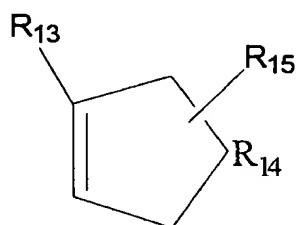
VI



VII

wherein  $R_{12}$  represents one or more alkyl radicals or one or more of H, Cl, OR and  $SO_3R_1$ ,  $NO_2$ ,  $PO_3R_1$  and X is a hetero atom other than carbon; and/or an olefin shown by formula

10 VIII,



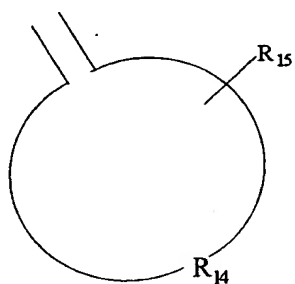
VIII

wherein  $R_{13}$  is Cl, or  $SO_3R_1$ , alkyl, O-alkyl, O-aryl and  $R_{14}$ , represents from 4-20 carbon

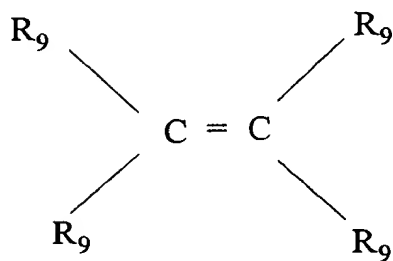
- 17 -

atoms such as to make H a cyclic or polycyclic alkane or polyalkenyl compound,  $R_{15}$ , is an epoxide or  $SO_3R_1$  reacted with an unsaturated portion of the ring comprising  $R_{14}$ ; and/or an exocyclic olefin shown by formula IX

5

**IX**

and/or an internal olefin shown by formula X,



- 18 -

**X**

where R<sub>9</sub> is the same or different and as hereinabove defined.

- 5 The dispersant copolymers of the present invention may also include copolymers being the water soluble derivatives of a combination of an unsaturated  $\alpha,\beta$ -unsaturated oxyacid or anhydride and another olefinic monomer, not limited to being of an alternating structure, that may have been derivatised post copolymerisation such as to provide the necessary substituents which may enhance water solubility and regularity of charge or polarity on the polymer.
- 10 Such derivatisation includes that obtained from reaction of groups pendant to the copolymer such as acids and acid derivatives with nucleophilic reagents such as alcohols, amines and thiols to give esters, amides and thioesters respectively.

In a further form of derivatisation copolymers with residual reactive unsaturation may be  
15 reacted with electrophilic or radical reagents such as peroxides or sulphite to give epoxides and sulphonates respectively.

In a special case of the above, copolymers with pendant aryl or heteroaryl groups can be made to undergo electrophilic aromatic substitution with sulphonating, nitrating and  
20 phosphating reagents.

While not wishing to be bound by theory, copolymers with hydroxyl groups can be esterified

- 29 -

as obtained from ECOTERIC AS 20 and ECOTERIC AS10 (Orica Australia Pty Ltd). Most preferred from the monoalkylsulphosuccinate class are sodium or potassium salts of cyclohexyl, iso-octyl and n-octyl sulphosuccinate. Most preferred from the dialkylsulphosuccinate class are sodium or potassium salts of dicyclohexyl, diisooctyl and di-n-octyl sulphosuccinates. Most preferred from the class of nonionic surfactants loaded onto insoluble porous silicate carriers are ethoxylated surfactants loaded onto carriers such as TERIC 157 (Orica Australia Pty Ltd). Most preferred wetting agents from the urea surfactant complexes are urea adducts of alcohol ethoxylate surfactants such as TERWET 7050 (Orica Australia Pty Ltd). The wetters herein described show good wettability and dispersibility for the formulations and have the additional advantage of showing storage stability in combination with the copolymer dispersants described. Whereas by comparison some commonly used WG and WP wetters such as alkylnaphthalene sulphonate salts and lignosulphonate salts have been found to show poor storage stability.

15 In the case of SC formulations in the present invention an active ingredient is typically added to water containing a dispersant, preferably with a surfactant wetting agent together with a conventional non-ionic dispersant. A humectant may also be included. A dispersion is formed using high shear mixing. The dispersion is then milled by any one of several means of wet milling so that the mean particle size of the dispersed solid is below 5  $\mu\text{m}$  more typically in the range of from 1 to 3  $\mu\text{m}$ . The resulting product is known as a millbase and may be modified with additives such as antifreeze, thickeners and antisetling agents, biocides and colouring agents may be added. For an SC formulation to be acceptable it should not

- 32 -

## Example 3.

A Simazine 900g/kg WG formulation of the following composition was prepared :

	Simazine tech. (98% w/w)	91.8 % w/w
5	ATPLUS G73050 (now sold under the trademark TERWET 7050, Orica Australia Pty Ltd)	1.5
	DISPERSANT	3.1
	Kaolin	3.1
	Water	0.5%

- 10 The dispersant used was the sodium salt of an alternating copolymer of n-octene and maleic anhydride of approximate molecular weight 20,000 to 30,000. The granules were prepared and tested in the manner described in Example 1. The results are shown in TABLE 1.

## Example 4.

- 15 A Simazine 900g/kg WG formulation was prepared and tested in the manner described in Example 3 with the dispersant being the sodium salt of a copolymer of n-decene and maleic anhydride. Results are shown in TABLE 1.

## Example 5.

- 20 A Simazine 900g/kg WG formulation was prepared and tested in the manner described in Example 3 with the dispersant being the sodium salt of a copolymer of diisobutylene and maleic anhydride of approximate molecular weight 20,000 to 30,000. Results are shown in TABLE 1.

- 33 -

## Example 6.

A WG formulation was prepared and tested as described in Example 3 with the dispersant being the sodium salt of SMA 1000 (Atochem Inc) which is a 1:1 molar ratio copolymer of styrene and maleic anhydride. Results are shown in TABLE 1.

5

## Example 7.

A WG formulation was prepared and tested as described in Example 3 with the dispersant being the sodium salt of SMA 3000 (Atochem Inc) which is a 3:1 molar ratio copolymer of styrene and maleic anhydride. Results are shown in TABLE 1.

10

## Example 8.

A WG formulation was prepared and tested as described in Example 3 with the dispersant being the sodium salt of GANTREZ AN 119 resin (Rhodia Inc) which is a copolymer of methylvinyl ether and maleic anhydride. Results are shown in TABLE 1.

15

## Example 9

A Simazine 900g/kg WG formulation of the following composition was prepared :

	Simazine tech. (98 % w/w)	91.8 % w/w
	ATPLUS G73050	1.5
20	(now sold under the trade mark TERWET 7050, Orica Australia Pty Ltd)	
	DISPERSANT	3.1
	Kaolin	3.1
	Water	0.5 %

**CLAIMS**

1. A method of dispersing an insoluble material in an aqueous solution comprising the following steps:

5

(i) providing a formulation comprising at least one insoluble material and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents.

20 (ii) dispersing said formulation in an aqueous medium.

- 43 -

2. A method according to claim 1 wherein the first comonomers are selected from the group consisting of fumaric acid, maleic acid and anhydrides, and the esters, amides and imides derived from them, itaconic acid and anhydride and the corresponding esters amides and imides derived from them, acrylic and methacrylic acids, esters and amides, 5 vinylphosphonic acid and the corresponding esters and amides derived from it and ethylene sulphonic acid and the esters and amides derived from it.
3. A method according to claim 1 wherein the second comonomer is selected from the group consisting of  $\beta$ -pinene, 5-ethylidene-2-norbornene, methylene cyclohexane and 10 methylene cyclopentane.
4. A method according to claim 1 wherein the second comonomer is selected from the group consisting of substituted and unsubstituted norbornene, cyclopentadiene and substituted cyclopentadienes, substituted and unsubstituted dicyclopentadienes , 15 cyclohexenes, furans and indenenes.
5. A method according to claim 1 wherein the second comonomer is selected from the group consisting of limonene and similar terpenes, vinyl cyclohexanes, vinyl cyclohexenes, vinyl pyridines, vinyl thiophenes, vinyl naphthalenes, vinyl furans, vinyl 20 pyrans and, vinyl pyrrolidones.
6. A method according to claim 1 wherein the second comonomer is an  $\alpha$ -olefin

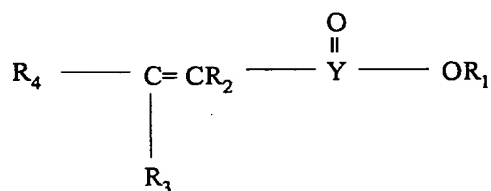


- 44 -

having an alkyl group selected from the group consisting of diisobutylene, isobutylene, n-octene, n-decene, allyglycidylether or vinylisobutylether.

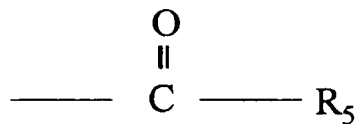
7. A method according to claim 1 wherein the first comonomer has a structure I

5



I

wherein  $\text{R}_1$  is M a metal, quaternary ammonium, phosphonium or sulphonium residue,  $\text{R}_2$  is hydrogen or  $\text{C}_1$  to  $\text{C}_4$  alkyl, Y is a carbon atom,  $\text{O}=\text{S}$ , or  $\text{POR}_1$  a hydrogen atom or  
 10 alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical) and  $\text{R}_4$  is H, an alkyl radical or a carboxylic acid derivative of form II



II

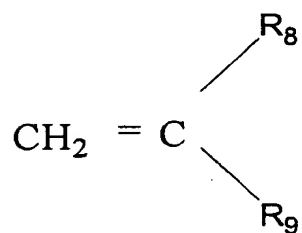
15 wherein  $\text{R}_5$  is  $\text{OR}_6$ ,  $\text{NR}_6\text{R}_7$ ,  $\text{SR}_6$ ,

- 45 -

wherein  $R_6, R_7$ , are H, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent.

8. A method according to claim 1 wherein the second comonomer has a structure III

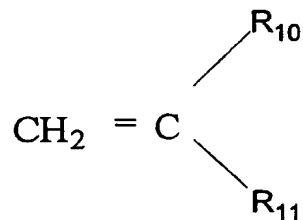
5



## III

wherein  $R_8$  represents hydrogen, a straight or branched chain alkyl of from 1-4 carbon atoms,  $R_9$  represents hydrogen, a branched chain alkylradical from 1-12 carbon atoms, or cycloalkyl radical,

- 10 and/or a vinyl compound of formula IV

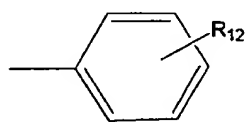


## IV

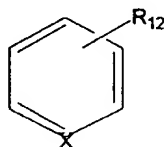
- 46 -

wherein  $R_{10}$  is a straight or branched chain alkyl radical of from 1-4 carbons and  $R_{11}$  is given by formula V, VI or VII,

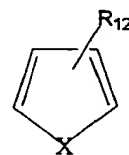
5



V



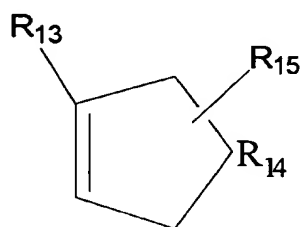
VI



VII

wherein  $R_{12}$  represents one or more alkyl radicals or one or more of H, Cl, OR and  $SO_3R_1$   $NO_2$ ,  $PO_3R_1$  and X is a hetero atom other than carbon; and/or an olefin shown by formula

10 VIII,



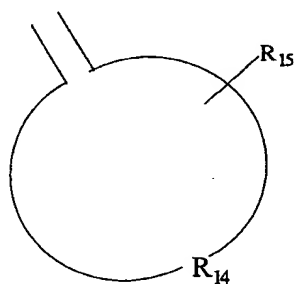
VIII

wherein  $R_{13}$  is Cl, or  $SO_3R_1$ , alkyl, O-alkyl, O-aryl and  $R_{14}$ , represents from 4-20 carbon

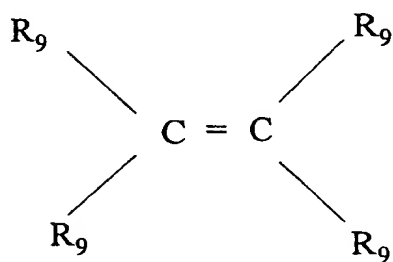
- 47 -

atoms such as to make H a cyclic or polycyclic alkane or polyalkenyl compound,  $R_{15}$ , is an epoxide or  $SO_3R_1$  reacted with an unsaturated portion of the ring comprising  $R_{14}$ ; and/or an exocyclic olefin shown by formula IX

5

**IX**

and/or an internal olefin shown by formula X,



- 48 -

X

where R<sub>9</sub> is the same or different and as hereinabove defined.

- 5 9. A method according to claim 1 wherein the copolymer contains additional comonomer residues which will not substantially change the character of the copolymer.
10. An agricultural formulation comprising at least one insoluble material and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a
- 10 first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first
- 15 functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of
- 20 electrophilic reagents.

- 49 -

11. An agricultural formulation according to claim 10 wherein the formulation is in the form of a suspension concentrate (SC), a wettable powder (WP) or a water dispersible granule (WG).

5 12. A method according to claim 10 wherein first comonomers are selected from the group consisting of fumaric acid, maleic acid and anhydrides, and the esters, amides and imides derived from them, itaconic acid and anhydride and the corresponding esters amides and imides derived from them, acrylic and methacrylic acids, esters and amides, vinylphosphonic acid and the corresponding esters and amides derived from it and  
10 ethylene sulphononic acid and the esters and amides derived from it.

13. A method according to claim 10 wherein the second comonomers are selected from the group consisting of  $\beta$ -pinene, 5-ethylidene-2-norbornene, methylene cyclohexane and methylene cyclopentane.

15

14. A method according to claim 10 wherein the second comonomers are selected from the group consisting of substituted and unsubstituted norbornene, cyclopentadiene and substituted cyclopentadienes, substituted and unsubstituted dicyclopentadienes, cyclohexenes, furans and indenenes.

20

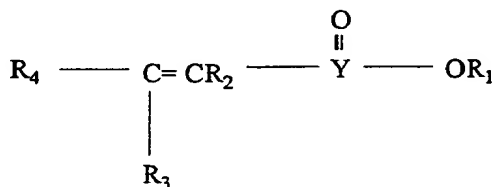
15. A method according to claim 10 wherein the second comonomers are selected from the group consisting of limonene and similar terpenes, vinyl cyclohexanes, vinyl

- 50 -

cyclohexenes, vinyl pyridines, vinyl thiophenes, vinyl naphthalenes, vinyl furans, vinyl pyrans and, vinyl pyrrolidones.

16. A method according to claim 10 wherein the first comonomers are selected from  
 5 the group consisting of an  $\alpha$ -olefin having an alkyl group selected from the group consisting of diisobutylene, isobutylene, n-octene, n-decene, allylglycidylether or vinylisobutylether.

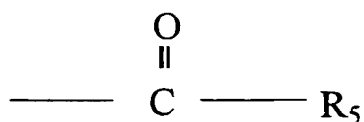
17. A method according to claim 10 wherein the first comonomers are selected from  
 10 the group consisting of structure I



# I

wherein  $\text{R}_1$  is M a metal, quaternary ammonium, phosphonium or sulphonium residue,  $\text{R}_2$   
 15 is hydrogen or  $\text{C}_1$  to  $\text{C}_4$  alkyl, Y is a carbon atom, O=S, or  $\text{POR}_1$  a hydrogen atom or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical) and  $\text{R}_4$  is H, an alkyl radical or a carboxylic acid derivative of form II

- 51 -

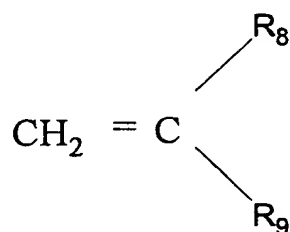
**II**

wherein  $\text{R}_5$  is  $\text{OR}_6$ ,  $\text{NR}_6\text{R}_7$ ,  $\text{SR}_6$ ,

5 wherein  $\text{R}_6, \text{R}_7$ , are H, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent.

18. A method according to claim 10 wherein the first comonomer is selected from the group consisting of III

10

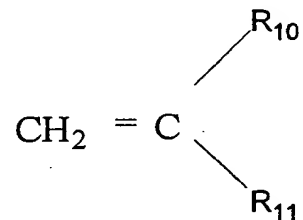
**III**

wherein  $\text{R}_8$  represents hydrogen, a straight or branched chain alkyl of from 1-4 carbon atoms,  $\text{R}_9$  represents hydrogen, a branched chain alkylradical from 1-12 carbon atoms, or



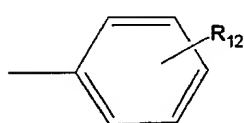
- 52 -

cycloalkyl radical, and/or a vinyl compound of formula IV

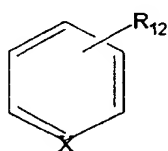


IV

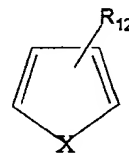
5 wherein  $\text{R}_{10}$  is a straight or branched chain alkyl radical of from 1-4 carbons and  $\text{R}_{11}$  is given by formula V, VI or VII,



V



VI

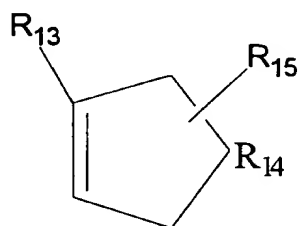


VII

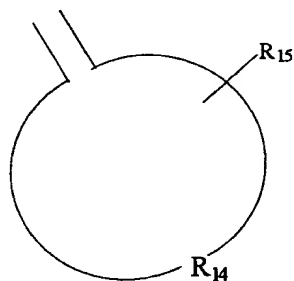
10

wherein  $\text{R}_{12}$  represents one or more alkyl radicals or one or more of  $\text{H}$ ,  $\text{Cl}$ ,  $\text{OR}$  and  $\text{SO}_3\text{R}_1$   
 $\text{NO}_2$ ,  $\text{PO}_3\text{R}_1$  and  $\text{X}$  is a hetero atom other than carbon; and/or an olefin shown by formula  
 VIII,

- 53 -

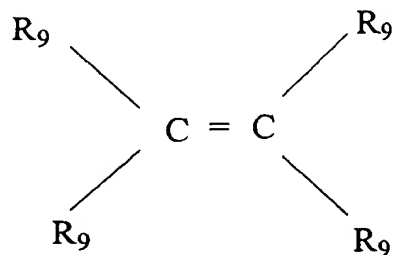
**VIII**

wherein  $R_{13}$  is Cl, or  $SO_3R_1$ , alkyl, O-alkyl, O-aryl and  $R_{14}$ , represents from 4-20 carbon atoms such as to make H a cyclic or polycyclic alkane or polyalkenyl compound,  $R_{15}$ , is  
5 an epoxide or  $SO_3R_1$  reacted with an unsaturated portion of the ring comprising  $R_{14}$ ;  
and/or an exocyclic olefin shown by formula IX

**IX**

10 and/or an internal olefin shown by formula X,

- 54 -

**X**

where  $R_9$  is the same or different and as hereinabove defined.

5

19. A method according to claim 10 wherein the copolymer contains additional comonomer residues which will not substantially change the character of the copolymer.

20. An agricultural formulation according to claim 10 wherein the dispersant is readily  
10 soluble in water.

21. An agricultural formulation according to claim 10 wherein the dispersant is an agriculturally acceptable salt of the copolymer and wherein the salt comprises sodium, potassium and/or ammonium ions.

15

22. An agricultural formulation according to claim 10 wherein the copolymer is

- 55 -

polyanionic.

23. An agricultural formulation according to claim 10 wherein the copolymer is in the form of its free acid.

5

24. An agricultural formulation according to claim 10 wherein the dispersant is a water-soluble agriculturally acceptable derivative of the copolymer wherein said derivative is selected from the group consisting of polyalkyleneoxy derivatives, polyethyleneglycol derivatives, polyamide derivatives and polyvinyl alcohol derivatives.

10

25. An agricultural formulation according to claim 10 wherein copolymers are in the range of from 1000 to 90000 daltons.

26. An agricultural formulation according to claim 10 wherein copolymers are in the  
15 range of from 1,000 to 30,000 daltons.

27. An agricultural formulation according to claim 10 wherein copolymers are in the range of from 10,000 to 30,000 daltons.

20 28. An agricultural formulation according to claim 10 wherein the water-insoluble materials are selected from the group consisting of herbicides, insecticides, fungicides, biocides, molluscicides, algaicides, plant growth regulators, anthelmintics, rodenticides, nematocides, acaricides, amoebicides, protozoacides, fertilizers, crop safeners fillers and

- 56 -

carriers and other adjuvants.

29. An agricultural formulation according to claim 10 wherein the formulation further comprises a surfactant wetting agent.

5

30. A method of making an agrochemical formulation comprising the steps of:

(i) combining at least one insoluble material, and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents;

10

15

20

31. A method according to claim 30 comprising the steps of:

- 57 -

- (i) combining at least one insoluble material, and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents;
- 15 (ii) milling said combination to a particle size range in order to obtain a stable, readily-suspendible aqueous dispersion; and
- (iii) stabilising said aqueous dispersion to obtain an SC formulation suitable for dilution in water for agricultural use.
- 20
32. A method according to claim 30 comprising the steps of:

- 58 -

- (i) combining at least one insoluble material, with at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents; and
- 15 (ii) milling said combination to a desired particle size to obtain a homogeneous wettable powder (WP) formulation.

33. A method according to claim 30 comprising the steps of:

20

- (i) combining at least one insoluble material suitable for agricultural use with at least one dispersant comprising a copolymer wherein said copolymer comprises a

- 59 -

residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents; and

(ii) blending said combination to obtain a homogeneous wettable powder (WP) formulation.

34. A method according to claim 30 comprising the steps of:

(i) combining at least one insoluble material suitable for agricultural use with at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second



- 60 -

comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents;

10

- (ii) agglomerating said combination to form discrete granular materials; and
- (iii) drying said granular materials to obtain a water dispersible granule WG formulation.

15

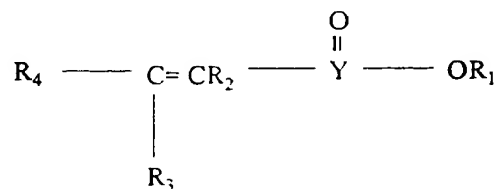
35. A method according to claim 30 wherein the first comonomers are selected from the group consisting of fumaric acid, maleic acid and anhydrides, and the esters, amides and imides derived from them, itaconic acid and anhydride and the corresponding esters amides and imides derived from them, acrylic and methacrylic acids, esters and amides, vinylphosphonic acid and the corresponding esters and amides derived from it and ethylene sulphonic acid and the esters and amides derived from it.

20

- 61 -

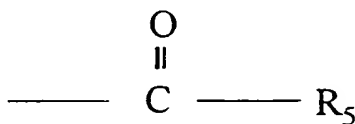
36. A method according to claim 30 wherein the second comonomer is selected from the group consisting of  $\beta$ -pinene, 5-ethylidene-2-norbornene, methylene cyclohexane and methylene cyclopentane.
- 5 37. A method according to claim 30 wherein the second comonomer is selected from the group consisting of substituted and unsubstituted norbornene, cyclopentadiene and substituted cyclopentadienes, substituted and unsubstituted dicyclopentadienes, cyclohexenes, furans and indenenes.
- 10 38. A method according to claim 30 wherein the second comonomer is selected from the group consisting of limonene and similar terpenes, vinyl cyclohexanes, vinyl cyclohexenes, vinyl pyridines, vinyl thiophenes, vinyl naphthalenes, vinyl furans, vinyl pyrans and, vinyl pyrrolidones.
- 15 39. A method according to claim 30 wherein the second comonomer is an  $\alpha$ -olefin having an alkyl group selected from the group consisting of diisobutylene, isobutylene, n-octene, n-decene, allylglycidylether or vinylisobutylether.
40. A method according to claim 30 wherein the first comonomer has a structure I

- 62 -



## I

wherein R<sub>1</sub> is M a metal, quaternary ammonium, phosphonium or sulphonium residue, R<sub>2</sub> is hydrogen or C<sub>1</sub> to C<sub>4</sub> alkyl, Y is a carbon atom, O=S, or POR<sub>1</sub> a hydrogen atom or  
 5 alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical) and R<sub>4</sub> is H, an alkyl radical or a carboxylic acid derivative of form II



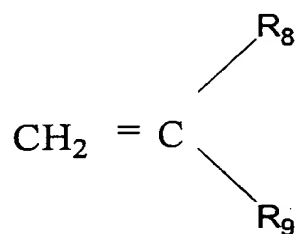
## II

10 wherein R<sub>5</sub> is OR<sub>6</sub>, NR<sub>6</sub>R<sub>7</sub>, SR<sub>6</sub>,

wherein R<sub>6</sub>, R<sub>7</sub>, are H, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent.

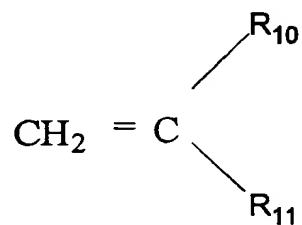
41. A method according to claim 30 wherein the second comonomer has a structure III

- 63 -



### III

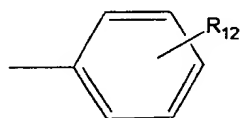
wherein  $\text{R}_8$  represents hydrogen, a straight or branched chain alkyl of from 1-4 carbon atoms,  $\text{R}_9$  represents hydrogen, a branched chain alkylradical from 1-12 carbon atoms, or  
5 cycloalkyl radical,  
and/or a vinyl compound of formula IV



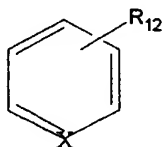
### IV

10 wherein  $\text{R}_{10}$  is a straight or branched chain alkyl radical of from 1-4 carbons and  $\text{R}_{11}$  is  
given by formula V, VI or VII,

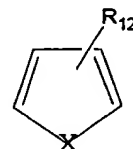
- 64 -



V



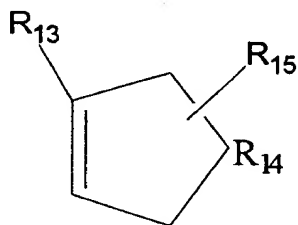
VI



VII

5

wherein  $R_{12}$  represents one or more alkyl radicals or one or more of H, Cl, OR and  $SO_3R_1$ ,  $NO_2$ ,  $PO_3R_1$  and X is a hetero atom other than carbon; and/or an olefin shown by formula VIII,



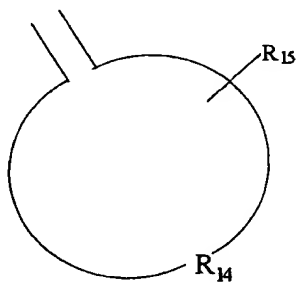
VIII

10

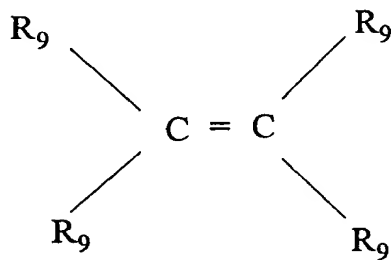
wherein  $R_{13}$  is Cl, or  $SO_3R_1$ , alkyl, O-alkyl, O-aryl and  $R_{14}$ , represents from 4-20 carbon atoms such as to make H a cyclic or polycyclic alkane or polyalkenyl compound,  $R_{15}$ , is an epoxide or  $SO_3R_1$  reacted with an unsaturated portion of the ring comprising  $R_{14}$ ;

- 65 -

and/or an exocyclic olefin shown by formula IX

**IX**

5 and/or an internal olefin shown by formula X,

**X**

- 66 -

where  $R_9$  is the same or different and as hereinabove defined.

42. A method according to claim 30 wherein the copolymer contains additional comonomer residues which will not substantially change the character of the polymer.

5

43. An agricultural formulation according to claim 30 wherein the dispersant is readily soluble in water.

44. An agricultural formulation according to claim 30 wherein the dispersant is an  
10 agriculturally acceptable salt of the copolymer and wherein the salt comprises sodium, potassium and/or ammonium ions.

45. An agricultural formulation according to claim 30 wherein the copolymer is polyanionic.

15

46. An agricultural formulation according to claim 30 wherein the copolymer is in the form of its free acid.

47. An agricultural formulation according to claim 30 wherein the dispersant is a water-  
20 soluble agriculturally acceptable derivative of the copolymer wherein said derivative is selected from the group consisting of polyalkyleneoxy derivatives, polyethyleneglycol derivatives, polyamide derivatives and polyvinyl alcohol derivatives.

- 67 -

48. An agricultural formulation according to claim 30 wherein copolymers are in the range of from 1000 to 90000 daltons.
49. An agricultural formulation according to claim 30 wherein copolymers are in the  
5 range of from 1,000 to 30,000 daltons.
50. An agricultural formulation according to claim 30 wherein copolymers are in the range of from 1,000 to 10,000 daltons.
- 10 51. An agricultural formulation according to claim 30 wherein the water-insoluble materials are selected from the group consisting of herbicides, insecticides, fungicides, biocides, molluscicides, algaicides, plant growth regulators, anthelmintics, rodenticides, nematocides, acaricides, amoebicides, protozoacides, fertilizers, crop safeners fillers and carriers and other adjuvants.
- 15
52. An agricultural formulation according to claim 30 wherein the formulation further comprises a surfactant wetting agent.
53. A method according to any one of claims 32 to 34 wherein said dispersant achieves a  
20 percentage suspensibility of greater than 80%.
54. A method according to claim 31 wherein said dispersant achieves a percentage suspensibility of greater than 90%.



- 68 -

55. A method according to either claim 32 or claim 33 wherein the milling step produces a mean particle size in the range of from 5 to 15 $\mu$ m.
56. A method according to claim 55 wherein the wettable powder has a wettability of less than 1 minute and a suspensibility above 80%.
57. A method according to claim 34 wherein the milling step produces a mean particle size in the range of from 5 to 15 $\mu$ m.
- 10 58. A method according to claim 34 wherein the formulation has a dispersion time of less than 1 minute.
59. A method according to claim 34 wherein the formulation has a dispersion time of less than 20 seconds.
- 15 60. A method according to claim 34 wherein the formulation has a suspensibility of above 80%.
61. A method according to claim 34 wherein the formulation has a wet sieve retention.
- 20 For a 150  $\mu$ m sieve is less than 0.1 % retained material and is for a 53  $\mu$ m sieve is less than 0.6%.
62. A method according to claim 31 wherein the milling step produces a mean particle

- 69 -

size of less than 5 $\mu$ m.

63. A method according to claim 31 wherein the milling step produces a mean particle size in the range of from 1 to 3  $\mu$ m.

5

64. An agricultural formulation produced by the method of any one of claims 31 to 34.

65. a method of treatment of a substrate with an insoluble material comprising the following steps:

10

- (i) preparing a formulation comprising at least one insoluble material and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates,
- 15
- 20

- 70 -

phosphates and other substituents derived from reaction with electrophilic reagents;

(ii) dispersing said formulation in an aqueous medium; and

5 (iii) applying the dispersed formulation to a substrate.

66. A method according to claim 65 wherein the first comonomers are selected from the group consisting of fumaric acid, maleic acid and anhydrides, and the esters, amides  
10 and imides derived from them, itaconic acid and anhydride and the corresponding esters amides and imides derived from them, acrylic and methacrylic acids, esters and amides, vinylphosphonic acid and the corresponding esters and amides derived from it and ethylene sulphonic acid and the esters and amides derived from it.

15 67. A method according to claim 65 wherein the second comonomer is selected from the group consisting of  $\beta$ -pinene, 5-ethylidene-2-norbornene, methylene cyclohexane and methylene cyclopentane.

68. A method according to claim 65 wherein the second comonomer is selected from  
20 the group consisting of substituted and unsubstituted norbornene, cyclopentadiene and substituted cyclopentadienes, substituted and unsubstituted dicyclopentadienes, cyclohexenes, furans and indenenes.

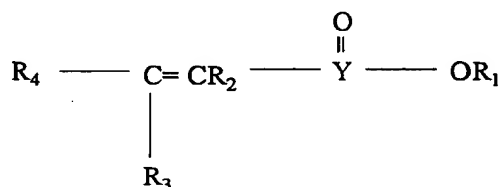
- 71 -

69. A method according to claim 65 wherein the second comonomer is selected from the group consisting of limonene and similar terpenes, vinyl cyclohexanes, vinyl cyclohexenes, vinyl pyridines, vinyl thiophenes, vinyl naphthalenes, vinyl furans, vinyl pyrans and, vinyl pyrrolidones.

5

70. A method according to claim 65 wherein the second comonomer is an  $\alpha$ -olefin having an alkyl group selected from the group consisting of diisobutylene, isobutylene, n-octene, n-decene, allylglycidylether or vinylisobutylether.

10 71. A method according to claim 65 wherein the first comonomer has a structure I

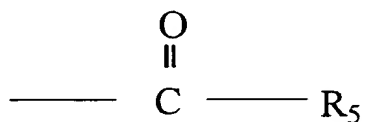


I

wherein  $\text{R}_1$  is M a metal, quaternary ammonium, phosphonium or sulphonium residue,  $\text{R}_2$  is hydrogen or  $\text{C}_1$  to  $\text{C}_4$  alkyl, Y is a carbon atom, O=S, or POR<sub>1</sub> a hydrogen atom or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical) and  $\text{R}_4$  is H, an alkyl radical or a carboxylic acid derivative of form II

15

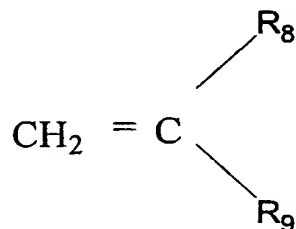
- 72 -

**II**

wherein  $\text{R}_5$  is  $\text{OR}_6$ ,  $\text{NR}_6\text{R}_7$ ,  $\text{SR}_6$ ,

5 wherein  $\text{R}_6, \text{R}_7$ , are H, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent.

72. A method according to claim 65 wherein the second comonomer has a structure III

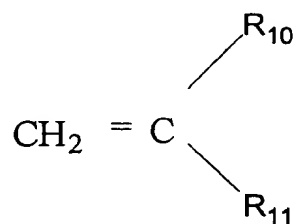


10

**III**

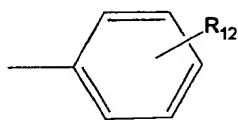
wherein  $\text{R}_8$  represents hydrogen, a straight or branched chain alkyl of from 1-4 carbon atoms,  $\text{R}_9$  represents hydrogen, a branched chain alkyl radical from 1-12 carbon atoms, or cycloalkyl radical,  
and/or a vinyl compound of formula IV

- 73 -

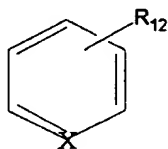


## IV

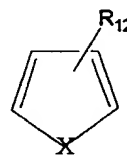
wherein  $\text{R}_{10}$  is a straight or branched chain alkyl radical of from 1-4 carbons and  $\text{R}_{11}$  is  
 5 given by formula V, VI or VII,



## V



## VI

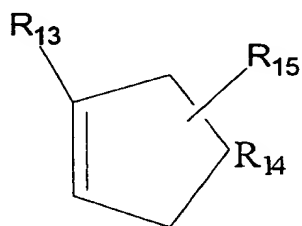


## VII

10

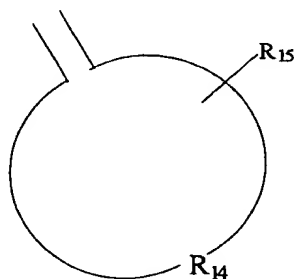
wherein  $\text{R}_{12}$  represents one or more alkyl radicals or one or more of H, Cl, OR and  $\text{SO}_3\text{R}_1$ ,  
 $\text{NO}_2$ ,  $\text{PO}_3\text{R}_1$  and X is a hetero atom other than carbon; and/or an olefin shown by formula  
 VIII,

- 74 -



## VIII

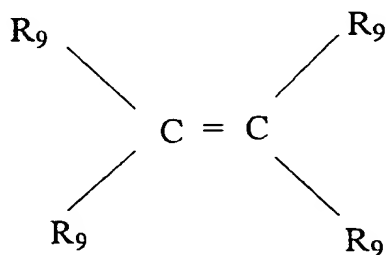
wherein  $R_{13}$  is Cl, or  $SO_3R_1$ , alkyl, O-alkyl, O-aryl and  $R_{14}$ , represents from 4-20 carbon atoms such as to make H a cyclic or polycyclic alkane or polyalkenyl compound,  $R_{15}$ , is  
 5 an epoxide or  $SO_3R_1$  reacted with an unsaturated portion of the ring comprising  $R_{14}$ ; and/or an exocyclic olefin shown by formula IX



## IX

10 and/or an internal olefin shown by formula X,

- 75 -



X

where  $R_9$  is the same or different and as hereinabove defined.

5

73. A method according to claim 65 wherein the copolymer contains additional comonomer residues which will not substantially change the character of the copolymer.

74. An agricultural formulation according to claim 65 wherein the dispersant is readily  
10 soluble in water.

75. An agricultural formulation according to claim 65 wherein the dispersant is an agriculturally acceptable salt of the copolymer and wherein the salt comprises sodium, potassium and/or ammonium ions.

15

76. An agricultural formulation according to claim 65 wherein the copolymer is



- 76 -

polyanionic.

77. An agricultural formulation according to claim 65 wherein the copolymer is in the form of its free acid.

5

78. An agricultural formulation according to claim 65 wherein the dispersant is a water-soluble agriculturally acceptable derivative of the copolymer wherein said derivative is selected from the group consisting of polyalkyleneoxy derivatives, polyethyleneglycol derivatives, polyamide derivatives and polyvinyl alcohol derivatives.

10

79. An agricultural formulation according to claim 65 wherein copolymers are in the range of from 1000 to 90000 daltons.

80. An agricultural formulation according to claim 65 wherein copolymers are in the  
15 range of from 1000 to 30000 daltons.

81. An agricultural formulation according to claim 65 wherein copolymers are in the range of from 1000 to 10000 daltons.

20 82. An agricultural formulation according to claim 65 wherein the water-insoluble materials are selected from the group consisting of herbicides, insecticides, fungicides, biocides, molluscicides, algaicides, plant growth regulators, anthelmintics, rodenticides, nematocides, acaricides, amoebicides, protozoacides, fertilizers, crop safeners fillers and

- 77 -

carriers and other adjuvants.

83. An agricultural formulation according to claim 65 wherein the formulation further comprises a surfactant wetting agent.

- 12 -

*not used*

invention include fumaric acid, maleic acid and anhydrides, and the esters, amides and imides derived from them, itaconic acid and anhydride and the corresponding esters amides and imides derived from them, acrylic and methacrylic acids and the corresponding esters and amides derived from them, vinylphosphonic acid and the corresponding esters and amides derived from it and ethylene sulphonic acid and the esters and amides derived from it.

The second comonomer for use in the present invention is an olefin having at least one polymerizable double bond which may be substituted as defined herein.

10

The second comonomer for use in the second embodiment of the present invention may be an alicyclic monomer having a polymerizable exo-cyclic double bond. It will be understood that by alicyclic monomer is meant an aliphatic cyclic monomer containing moieties such as a cyclic alkyl, cyclic alkenyl or heterocyclic groups and which may comprise one or more carbocyclic or heterocyclic rings. It will be understood that by exo-cyclic is meant an alkylidene substituted cyclic structure. Alicyclic monomers having a polymerizable exo-cyclic double bond may optionally be substituted. Alicyclic monomers having a polymerizable exo-cyclic double bond of the present invention may include, for example,  $\beta$ -pinene, 5-ethylidene-2-norbornene, methylene cyclohexane and methylene cyclopentane. The most preferred alicyclic monomer having a polymerizable exo-cyclic double bond.

20

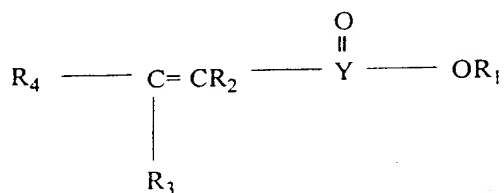
The second comonomer for use in the second embodiment of the present invention may be an alicyclic monomer having a polymerizable endo-cyclic double bond. The term alicyclic

- 14 -

allyglycidylether or vinylisobutylether. The second comonomer may also be an internal olefin.

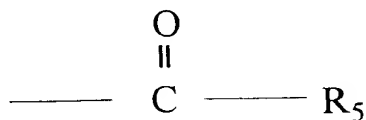
Preferred examples of the first comonomer may be described as having structure I

5



II

wherein  $\text{R}_1$  is a metal, quaternary ammonium, phosphonium or sulphonium residue,  $\text{R}_2$  is hydrogen or  $\text{C}_1$  to  $\text{C}_4$  alkyl, Y is a carbon atom,  $\text{O}=\text{S}$ , or  $\text{POR}$  where R is a hydrogen atom  
10 or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical) and  $\text{R}_4$  is H, an alkyl radical or a carboxylic acid derivative of form II

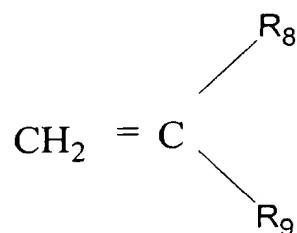


II

15 wherein  $\text{R}_5$  is  $\text{OR}_6$ ,  $\text{NR}_6\text{R}_7$ ,  $\text{SR}_6$ ,

- 15 -

wherein  $R_6$  and  $R_7$  are H, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent. The second comonomer may be alternatively described as a residue having formula III

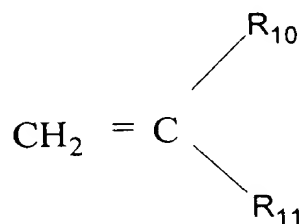


5

III

wherein  $R_8$  represents hydrogen, a straight or branched chain alkyl of from 1-4 carbon atoms,  $R_9$  represents hydrogen, a branched chain alkyl radical of from 1-12 carbon atoms, or a cycloalkyl radical, and/or a vinyl compound of formula IV

10

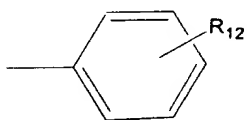
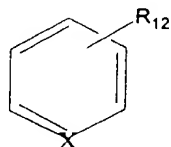
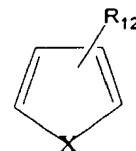


IV

- 16 -

wherein  $R_{10}$  is a straight or branched chain alkyl radical of from 1-4 carbons and  $R_{11}$  is given by formula V, VI or VII,

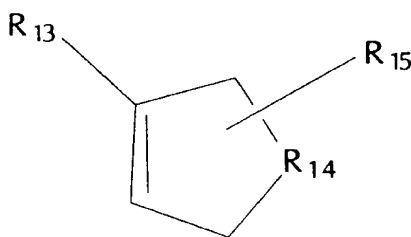
5

**V****VI****VII**

wherein  $R_{12}$  represents one or more alkyl radicals or one or more of H, Cl, OR and  $SO_3R$ ,  $NO_2$ ,  $PO_3R_1$  and X is a hetero atom other than carbon; and/or an olefin shown by formula

10 **VIII**,

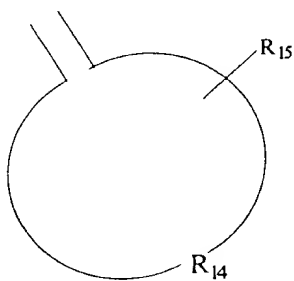
15

**VIII**

wherein  $R_{13}$  is Cl,  $SO_3R_1$ , alkyl, O-alkyl or O-aryl, and  $R_{14}$  represents from 4-20 carbon

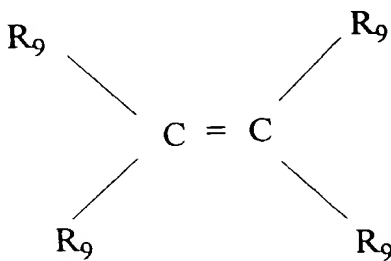
- 17 -

atoms such as to make a cyclic or polycyclic alkane or polyalkenyl compound,  $R_{15}$ , is an epoxide or  $SO_3R_1$  reacted with an unsaturated portion of the ring comprising  $R_{14}$ ; and/or an exocyclic olefin shown by formula IX



10 IX

and/or an internal olefin shown by formula X,



20 X

- 29 -

as obtained from ECOTERIC AS 20 and ECOTERIC AS10 (Huntsman Corporation Australia Pty Ltd). Most preferred from the monoalkylsulphosuccinate class are sodium or potassium salts of cyclohexyl, iso-octyl and n-octyl sulphosuccinate. Most preferred from the dialkylsulphosuccinate class are sodium or potassium salts of dicyclohexyl, diisooctyl and di-n-octyl sulphosuccinates. Most preferred from the class of nonionic surfactants loaded onto insoluble porous silicate carriers are ethoxylated surfactants loaded onto carriers such as TERIC 157 (Huntsman Corporation Australia Pty Ltd). Most preferred wetting agents from the urea surfactant complexes are urea adducts of alcohol ethoxylate surfactants such as TERWET 7050 (Huntsman Corporation Australia Pty Ltd). The wetters herein described show good wettability and dispersibility for the formulations and have the additional advantage of showing storage stability in combination with the copolymer dispersants described. Whereas by comparison some commonly used WG and WP wetters such as alkylnaphthalene sulphonate salts and lignosulphonate salts have been found to show poor storage stability.

15

In the case of SC formulations in the present invention an active ingredient is typically added to water containing a dispersant, preferably with a surfactant wetting agent together with a conventional non-ionic dispersant. A humectant may also be included. A dispersion is formed using high shear mixing. The dispersion is then milled by any one of several means of wet milling so that the mean particle size of the dispersed solid is below 5  $\mu\text{m}$  more typically in the range of from 1 to 3  $\mu\text{m}$ . The resulting product is known as a millbase and may be modified with additives such as antifreeze, thickeners and antisetling agents, biocides and colouring agents may be added. For an SC formulation to be acceptable it should not



- 32 -

## Example 3.

A Simazine 900g/kg WG formulation of the following composition was prepared :

	Simazine tech. (98% w/w)	91.8 % w/w
5	ATPLUS G73050 (now sold under the trademark TERWET 7050, Huntsman Corporation Australia Pty Ltd)	1.5
	DISPERSANT	3.1
	Kaolin	3.1
10	Water	0.5%

The dispersant used was the sodium salt of an alternating copolymer of n-octene and maleic anhydride of approximate molecular weight 20,000 to 30,000. The granules were prepared and tested in the manner described in Example 1. The results are shown in TABLE 1.

## 15 Example 4.

A Simazine 900g/kg WG formulation was prepared and tested in the manner described in Example 3 with the dispersant being the sodium salt of a copolymer of n-decene and maleic anhydride. Results are shown in TABLE 1.

## 20 Example 5.

A Simazine 900g/kg WG formulation was prepared and tested in the manner described in Example 3 with the dispersant being the sodium salt of a copolymer of diisobutylene and maleic anhydride of approximate molecular weight 20,000 to 30,000. Results are shown in TABLE 1.

25

- 33 -

## Example 6.

A WG formulation was prepared and tested as described in Example 3 with the dispersant being the sodium salt of SMA 1000 (Atochem Inc) which is a 1:1 molar ratio copolymer of styrene and maleic anhydride. Results are shown in TABLE 1.

5

## Example 7.

A WG formulation was prepared and tested as described in Example 3 with the dispersant being the sodium salt of SMA 3000 (Atochem Inc) which is a 3:1 molar ratio copolymer of styrene and maleic anhydride. Results are shown in TABLE 1.

10

## Example 8.

A WG formulation was prepared and tested as described in Example 3 with the dispersant being the sodium salt of GANTREZ AN 119 resin (Rhodia Inc) which is a copolymer of methylvinyl ether and maleic anhydride. Results are shown in TABLE 1.

15

## Example 9

A Simazine 900g/kg WG formulation of the following composition was prepared :

	Simazine tech. (98% w/w)	91.8 % w/w
20	ATPLUS G73050 (now sold under the trade mark TERWET 7050, Huntsman Corporation Australia Pty Ltd)	1.5
	DISPERSANT	3.1
	Kaolin	3.1
25	Water	0.5%

- 42 -

## CLAIMS

1. A method of dispersing an insoluble material in an aqueous solution comprising the following steps:

5

(i) providing a formulation comprising at least one insoluble material and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein the second comonomer is selected from the group consisting of  $\beta$ -pinene, 5-ethylidene-2-norbornene, methylene cyclohexane and methylene cyclopentene;

10

(ii) dispersing said formulation in an aqueous medium.

15

2. A method according to claim 1 wherein the copolymer contains additional comonomer residues which will not substantially change the character of the copolymer.

3. A method of treatment of a substrate with an insoluble material comprising the following steps:

20

(i) preparing a formulation comprising at least one insoluble material and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein the second comonomer is selected from the group consisting of  $\beta$ -pinene, 5-ethylidene-2-norbornene, methylene cyclohexane and methylene cyclopentane;

25

30

- 43 -

- (ii) dispersing said formulation in an aqueous medium; and
- (iii) applying the dispersed formulation to a substrate.

5 4. A method of treatment of a substrate with an insoluble material comprising the following steps:

- (i) preparing a formulation comprising at least one insoluble material and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of  
10 a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein the second comonomer is selected from the group consisting of limonene and similar terpenes, vinyl cyclohexanes, vinyl cyclohexenes, vinyl pyridines, vinyl  
15 thiophenes, vinyl naphthalenes, vinyl furans, vinyl pyrans and vinyl pyrrolidones;
- (ii) dispersing said formulation in an aqueous medium; and
- (iii) applying the dispersed formulation to a substrate.

20

5. A method of treatment of a substrate with an insoluble material comprising the following steps:

- (i) preparing a formulation comprising at least one insoluble material and at least one  
25 dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein the second comonomer is an  $\alpha$ -olefin having an alkyl group selected from the group  
30 consisting of diisobutylene, isobutylene, n-octene, n-decene, allylglycidylether or

- 44 -

vinylisobutylether;

- (ii) dispersing said formulation in an aqueous medium; and
- 5 (iii) applying the dispersed formulation to a substrate.
6. A method of treatment of a substrate with an insoluble material comprising the following steps:
- 10 (i) preparing a formulation comprising at least one insoluble material and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein
- 15 at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and
- 20 optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents, wherein said comonomer is in free acid form;
- 25 (ii) dispersing said formulation in an aqueous medium; and
- (iii) applying the dispersed formulation to a substrate.
- 30 7. A method of treatment of a substrate with an insoluble material comprising the

- 45 -

following steps:

- 5 (i) preparing a formulation comprising at least one insoluble material and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents, wherein the dispersant is a water-soluble agriculturally acceptable derivative of the copolymer wherein said derivative is selected from the group consisting of polyalkyleneoxy derivatives, polyethyleneglycol derivatives, polyamide derivatives and polyvinyl alcohol derivatives;
- 10 20 (ii) dispersing said formulation in an aqueous medium; and
- (iii) applying the dispersed formulation to a substrate.

25 8. A method of treatment of a substrate with an insoluble material comprising the following steps:

- (i) preparing a formulation comprising at least one insoluble material, a surfactant wetting agent and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second
- 30

- 46 -

comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents;

- (ii) dispersing said formulation in an aqueous medium; and
- (iii) applying the dispersed formulation to a substrate.

9. A method of dispersing active water-insoluble agrochemical principal in an aqueous solution comprising the following steps:

- (i) providing a formulation comprising at least one active water-insoluble agrochemical principal and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic

- 47 -

and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents;

5 (ii) dispersing said formulation in an aqueous medium.

10. A method according to claim 9 wherein the first comonomers are selected from the group consisting of fumaric acid, maleic acid and anhydrides, and the esters, amides and  
10 imides derived from them, itaconic acid and anhydride and the corresponding esters amides and imides derived from them, acrylic and methacrylic acids and the corresponding esters and amides derived from them, vinylphosphonic acid and the corresponding esters and amides derived from it and ethylene sulphonic acid and the esters and amides derived from it.

15

11 A method according to claim 9 wherein the second comonomer is selected from the group consisting of  $\beta$ -pinene, 5-ethylidene-2-norbornene, methylene cyclohexane and methylene cyclopentane.

20 12. A method according to claim 9 wherein the second comonomer is selected from the group consisting of substituted and unsubstituted norbornene, cyclopentadiene and substituted cyclopentadienes, substituted and unsubstituted dicyclopentadienes, cyclohexenes, furans and indenenes.

25 13. A method according to claim 9 wherein the second comonomer is selected from the group consisting of limonene and similar terpenes, vinyl cyclohexanes, vinyl cyclohexenes, vinyl pyridines, vinyl thiophenes, vinyl naphthalenes, vinyl furans, vinyl pyrans and, vinyl pyrrolidones.

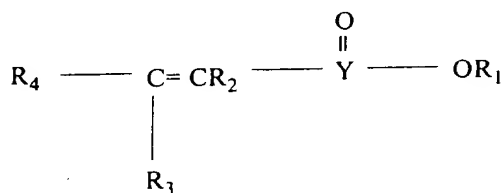
30 14. A method according to claim 9 wherein the second comonomer is an  $\alpha$ -olefin



- 48 -

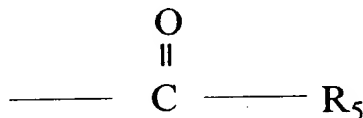
having an alkyl group selected from the group consisting of diisobutylene, isobutylene, n-octene, n-decene, allyglycidylether or vinylisobutylether.

15. A method according to claim 9 wherein the first comonomer has a structure I



II

wherein  $\text{R}_1$  is a metal, quaternary ammonium, phosphonium or sulphonium residue,  $\text{R}_2$  is hydrogen or  $\text{C}_1$  to  $\text{C}_4$  alkyl, Y is a carbon atom,  $\text{O}=\text{S}$ , or  $\text{POR}$  where R is a hydrogen atom or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical) and  $\text{R}_4$  is H, an alkyl radical or a carboxylic acid derivative of formula II



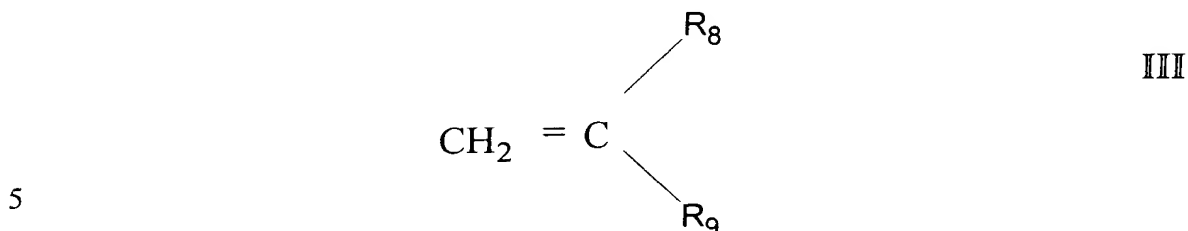
III

- 15 wherein  $\text{R}_5$  is  $\text{OR}_6$ ,  $\text{NR}_6\text{R}_7$  or  $\text{SR}_6$ ,

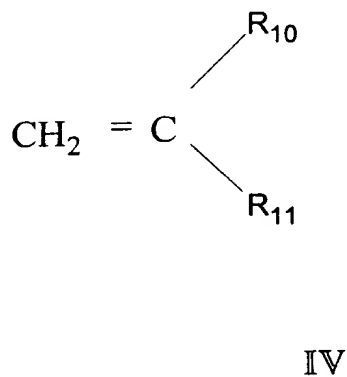
wherein  $\text{R}_6$  and  $\text{R}_7$  are H, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent.

16. A method according to claim 9 wherein the second comonomer is a vinyl compound of formula III

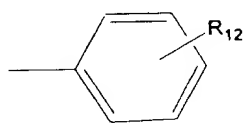
- 49 -



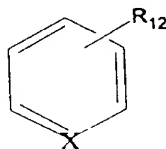
wherein  $\text{R}_8$  represents hydrogen, a straight or branched chain alkyl of from 1-4 carbon atoms,  $\text{R}_9$  represents hydrogen, a branched chain alkyl radical of from 1-12 carbon atoms,  
10 or cycloalkyl radical,  
and/or a vinyl compound of formula IV



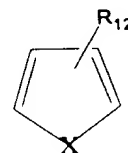
15 wherein  $\text{R}_{10}$  is a straight or branched chain alkyl radical of from 1-4 carbons and  $\text{R}_{11}$  is given by formula V, VI or VII,



V



VI



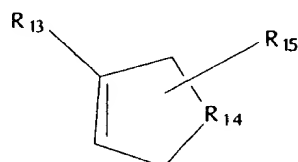
VII

20

- 50 -

wherein  $R_{12}$  represents one or more alkyl radicals or one or more of H, Cl, OR and  $SO_3R_1$ ,  $NO_2$ ,  $PO_3R_1$  and X is a hetero atom other than carbon; and/or an olefin shown by formula VIII,

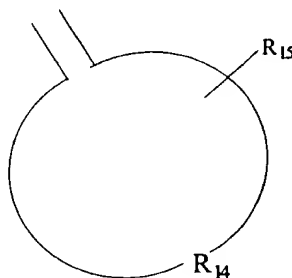
5



VIII

wherein  $R_{13}$  is Cl,  $SO_3R_1$ , alkyl, O-alkyl or O-aryl, and  $R_{14}$  represents from 4-20 carbon atoms such as to make a cyclic or polycyclic alkane or polyalkenyl compound,  $R_{15}$  is an  
10 epoxide or  $SO_3R_1$  reacted with an unsaturated portion of the ring comprising  $R_{14}$ ; and/or an exocyclic olefin shown by formula IX

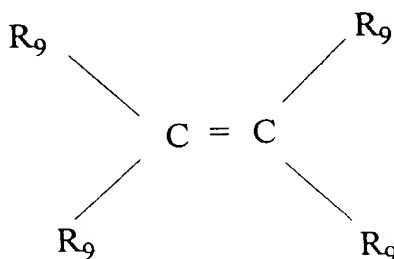
15



IX

20

and/or an internal olefin shown by formula X,



X

- 51 -

where  $R_9$  is the same or different and as hereinabove defined.

17. A method according to claim 9 wherein the copolymer contains additional comonomer residues which will not substantially change the character of the copolymer.

5

18. An agricultural formulation comprising at least one insoluble material and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents.

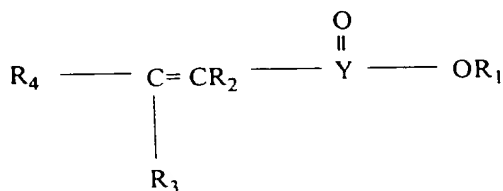
19. An agricultural formulation according to claim 18 wherein the formulation is in the form of a suspension concentrate (SC), a wettable powder (WP) or a water dispersible granule (WG).

20. An agricultural formulation according to claim 18 wherein first comonomers are selected from the group consisting of fumaric acid, maleic acid and anhydrides, and the esters, amides and imides derived from them, itaconic acid and anhydride and the corresponding esters amides and imides derived from them, acrylic and methacrylic acids and the esters and amides derived from them, vinylphosphonic acid and the corresponding esters and amides derived from it and ethylene sulphonic acid and the esters and amides derived from it.

30

- 52 -

21. An agricultural formulation according to claim 18 wherein the second comonomers are selected from the group consisting of  $\beta$ -pinene, 5-ethylidene-2-norbornene, methylene cyclohexane and methylene cyclopentane.
- 5 22. An agricultural formulation according to claim 18 wherein the second comonomers are selected from the group consisting of substituted and unsubstituted norbornene, cyclopentadiene and substituted cyclopentadienes, substituted and unsubstituted dicyclopentadienes, cyclohexenes, furans and indenenes.
- 10 23. An agricultural formulation according to claim 18 wherein the second comonomers are selected from the group consisting of limonene and similar terpenes, vinyl cyclohexanes, vinyl cyclohexenes, vinyl pyridines, vinyl thiophenes, vinyl naphthalenes, vinyl furans, vinyl pyrans and, vinyl pyrrolidones.
- 15 24. An agricultural formulation according to claim 18 wherein the first comonomers are selected from the group consisting of an  $\alpha$ -olefin having an alkyl group selected from the group consisting of diisobutylene, isobutylene, n-octene, n-decene, allylglycidylether or vinylisobutylether.
- 20 25. An agricultural formulation according to claim 18 wherein the first comonomers are selected from the group consisting of structure I



I

wherein  $\text{R}_1$  is a metal, quaternary ammonium, phosphonium or sulphonium residue,  $\text{R}_2$  is  
 30 hydrogen or  $\text{C}_1$  to  $\text{C}_4$  alkyl, Y is a carbon atom,  $\text{O}=\text{S}$ , or  $\text{POR}$  where R is a hydrogen

- 53 -

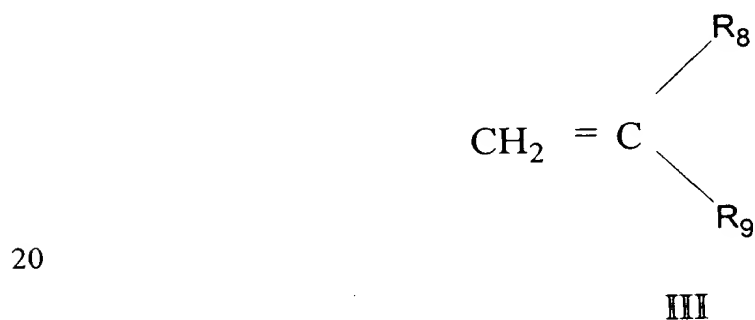
atom or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical) and  $R_4$  is H, an alkyl radical or a carboxylic acid derivative of formula II



10 wherein  $R_5$  is  $OR_6$ ,  $NR_6R_7$  or  $SR_6$ ,

wherein  $R_6$  and  $R_7$  are H, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent.

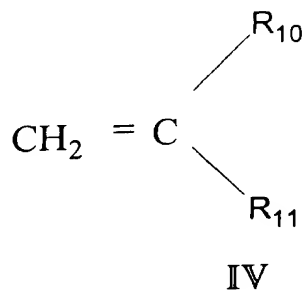
26. An agricultural formulation according to claim 18 wherein the first comonomer is  
15 selected from the group consisting of III



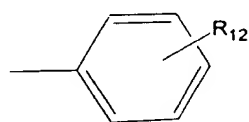
wherein  $R_8$  represents hydrogen, a straight or branched chain alkyl of from 1-4 carbon atoms,  $R_9$  represents hydrogen, a branched chain alkyl radical of from 1-12 carbon atoms, or a cycloalkyl radical, and/or a vinyl compound of formula IV

25

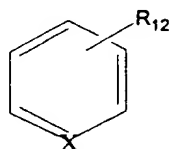
- 54 -



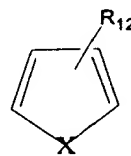
wherein  $\text{R}_{10}$  is a straight or branched chain alkyl radical of from 1-4 carbons and  $\text{R}_{11}$  is given by formula V, VI or VII,



V

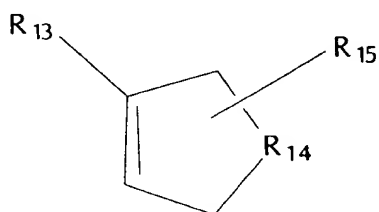


VI



VII

wherein  $\text{R}_{12}$  represents one or more alkyl radicals or one or more of  $\text{H}$ ,  $\text{Cl}$ ,  $\text{OR}$  and  $\text{SO}_3\text{R}_1$ ,  $\text{NO}_2$ ,  $\text{PO}_3\text{R}_1$  and  $\text{X}$  is a hetero atom other than carbon; and/or an olefin shown by formula VIII,



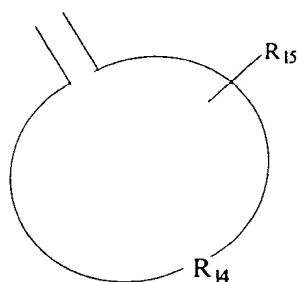
VIII

wherein  $\text{R}_{13}$  is  $\text{Cl}$ ,  $\text{SO}_3\text{R}$ , alkyl, O-alkyl or O-aryl, and  $\text{R}_{14}$  represents from 4-20 carbon atoms such as to make a cyclic or polycyclic alkane or polyalkenyl compound,  $\text{R}_{15}$  is an

- 55 -

epoxide or  $\text{SO}_3\text{R}_1$  reacted with an unsaturated portion of the ring comprising  $\text{R}_{14}$ ;  
and/or an exocyclic olefin shown by formula IX

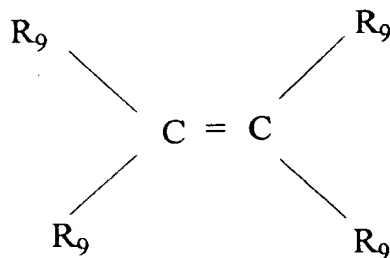
5



10

IX

and/or an internal olefin shown by formula X,



15

X

where  $\text{R}_9$  is the same or different and as hereinabove defined.

27. An agricultural formulation according to claim 18 wherein the copolymer contains  
20 additional comonomer residues which will not substantially change the character of the  
copolymer.

28. An agricultural formulation according to claim 18 wherein the dispersant is readily



- 56 -

soluble in water.

29. An agricultural formulation according to claim 18 wherein the dispersant is an agriculturally acceptable salt of the copolymer and wherein the salt comprises sodium, potassium and/or ammonium ions.
30. An agricultural formulation according to claim 18 wherein the copolymer is polyanionic.
31. An agricultural formulation according to claim 18 wherein the copolymer is in the form of its free acid.
32. An agricultural formulation according to claim 18 wherein the dispersant is a water-soluble agriculturally acceptable derivative of the copolymer wherein said derivative is selected from the group consisting of polyalkyleneoxy derivatives, polyethyleneglycol derivatives, polyamide derivatives and polyvinyl alcohol derivatives.
33. An agricultural formulation according to claim 18 wherein copolymers are in the range of from 1000 to 90000 daltons.
34. An agricultural formulation according to claim 18 wherein the water-insoluble materials are selected from the group consisting of herbicides, insecticides, fungicides, biocides, molluscicides, algaicides, plant growth regulators, anthelmintics, rodenticides, nematocides, acaricides, amoebicides, protozoacides, fertilizers, crop safeners, fillers and carriers and other adjuvants.
35. An agricultural formulation according to claim 18 wherein the formulation further comprises a surfactant wetting agent.
36. An agricultural formulation according to claim 35 wherein the surfactant wetting

- 57 -

agent is selected from the group consisting of an alkylpolysaccharide; di or mono alkyl sulphosuccinate derivative; a nonionic surfactant loaded onto an inert silicate carrier; and a non-ionic surfactant delivered in the form of a urea surfactant complex.

5 37. A method of making an agrochemical formulation comprising the steps of:

- (i) combining at least one insoluble material, and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -  
10 unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents  
15 and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents.

20

38. A method according to claim 37 comprising the steps of:

- (i) combining at least one insoluble material, and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a  
25 residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents  
30

- 58 -

and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents;

- 5
- (ii) milling said combination to a particle size range in order to obtain a stable, readily-suspendible aqueous dispersion; and
- 10 (iii) stabilising said aqueous dispersion to obtain an SC formulation suitable for dilution in water for agricultural use.

38. A method according to claim 37 comprising the steps of:

- 15 (i) combining at least one insoluble material, with at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first
- 20 comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted
- 25 pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents; and
- (ii) milling said combination to a desired particle size to obtain a homogeneous
- 30 wettable powder (WP) formulation.

- 59 -

39. A method according to claim 37 comprising the steps of:
- (i) combining at least one insoluble material suitable for agricultural use with at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents; and
- (ii) blending said combination to obtain a homogeneous wettable powder (WP) formulation.
40. A method according to claim 37 comprising the steps of:
- (i) combining at least one insoluble material suitable for agricultural use with at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group

- 60 -

consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents;

- (ii) agglomerating said combination to form discrete granular materials; and
- 10 (iii) drying said granular materials to obtain a water dispersible granule WG formulation.

41. A method according to claim 37 wherein the first comonomers are selected from the group consisting of fumaric acid, maleic acid and anhydrides, and the esters, amides and imides derived from them, itaconic acid and anhydride and the corresponding esters amides and imides derived from them, acrylic and methacrylic acids and the corresponding esters and amides derived from them, vinylphosphonic acid and the corresponding esters and amides derived from it and ethylene sulphononic acid and the esters and amides derived from it.

20

42. A method according to claim 37 wherein the second comonomer is selected from the group consisting of  $\beta$ -pinene, 5-ethylidene-2-norbornene, methylene cyclohexane and methylene cyclopentane.

25 43. A method according to claim 37 wherein the second comonomer is selected from the group consisting of substituted and unsubstituted norbornene, cyclopentadiene and substituted cyclopentadienes, substituted and unsubstituted dicyclopentadienes, cyclohexenes, furans and indenenes.

30 44. A method according to claim 37 wherein the second comonomer is selected from

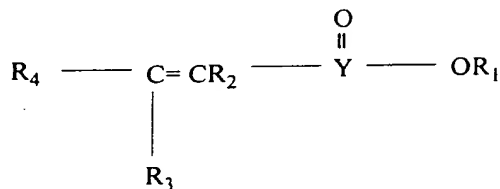
- 61 -

the group consisting of limonene and similar terpenes, vinyl cyclohexanes, vinyl cyclohexenes, vinyl pyridines, vinyl thiophenes, vinyl naphthalenes, vinyl furans, vinyl pyrans and vinyl pyrrolidones.

5 45. A method according to claim 37 wherein the second comonomer is an  $\alpha$ -olefin having an alkyl group selected from the group consisting of diisobutylene, isobutylene, n-octene, n-decene, allylglycidylether or vinylisobutylether.

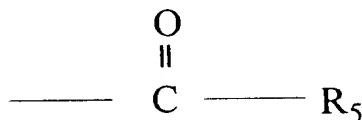
46. A method according to claim 37 wherein the first comonomer has a structure I

10



II

wherein  $\text{R}_1$  is a metal, quaternary ammonium, phosphonium or sulphonium residue,  $\text{R}_2$  is hydrogen or  $\text{C}_1$  to  $\text{C}_4$  alkyl, Y is a carbon atom, O=S, or POR where R is a hydrogen  
15 atom or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical) and  $\text{R}_4$  is H, an alkyl radical or a carboxylic acid derivative of form II



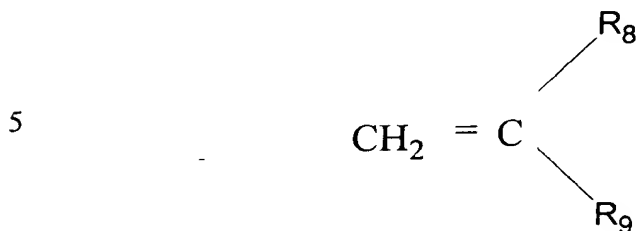
III

20 wherein  $\text{R}_5$  is  $\text{OR}_6$ ,  $\text{NR}_6\text{R}_7$ ,  $\text{SR}_6$ ,

- 62 -

wherein  $R_6$  and  $R_7$  are H, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent.

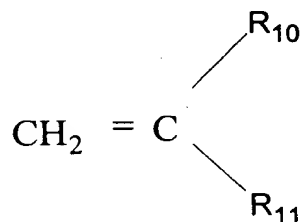
47. A method according to claim 37 wherein the second comonomer has a structure III



III

wherein  $R_8$  represents hydrogen, a straight or branched chain alkyl of from 1-4 carbon atoms,  $R_9$  represents hydrogen, a branched chain alkyl radical of from 1-12 carbon atoms, or a cycloalkyl radical,

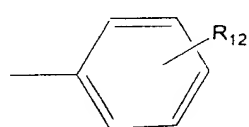
10 and/or a vinyl compound of formula IV



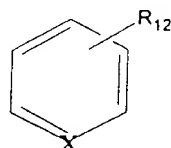
IV

wherein  $R_{10}$  is a straight or branched chain alkyl radical of from 1-4 carbons and  $R_{11}$  is  
15 given by formula V, VI or VII,

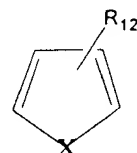
- 63 -



V

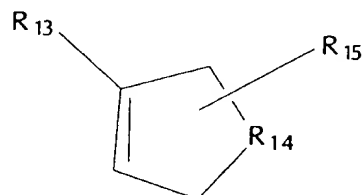


VI



VII

wherein  $R_{12}$  represents one or more alkyl radicals or one or more of H, Cl, OR and  $SO_3R_1$   
 5  $NO_2$ ,  $PO_3R_1$  and X is a hetero atom other than carbon; and/or an olefin shown by formula VIII,

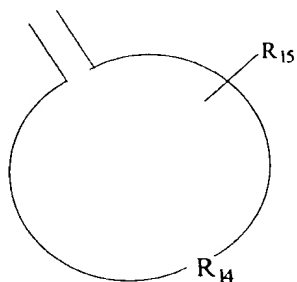


VIII

10

wherein  $R_{13}$  is Cl,  $SO_3R_1$ , alkyl, O-alkyl or O-aryl, and  $R_{14}$  represents from 4-20 carbon atoms such as to make a cyclic or polycyclic alkane or polyalkenyl compound,  $R_{15}$  is an epoxide or  $SO_3R_1$  reacted with an unsaturated portion of the ring comprising  $R_{14}$ ;

15 and/or an exocyclic olefin shown by formula IX



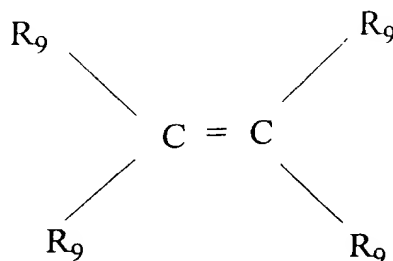
IX

and/or an internal olefin shown by formula X,

20



- 64 -



X

where  $R_9$  is the same or different and as hereinabove defined.

5

48. A method according to claim 37 wherein the copolymer contains additional comonomer residues which will not substantially change the character of the polymer.

49. A method according to claim 37 wherein the dispersant is readily soluble in water.

10

50. A method according to claim 37 wherein the dispersant is an agriculturally acceptable salt of the copolymer and wherein the salt comprises sodium, potassium and/or ammonium ions.

15

51. A method according to claim 37 wherein the copolymer is polyanionic.

52. A method according to claim 37 wherein the copolymer is in the form of its free acid.

53. A method according to claim 37 wherein the dispersant is a water-soluble

20 agriculturally acceptable derivative of the copolymer wherein said derivative is selected from the group consisting of polyalkyleneoxy derivatives, polyethyleneglycol derivatives, polyamide derivatives and polyvinyl alcohol derivatives.

54. A method according to claim 37 wherein copolymers are in the range of from 1000

- 65 -

to 90000 daltons.

55. A method according to claim 37 wherein the water-insoluble materials are selected from the group consisting of herbicides, insecticides, fungicides, biocides, molluscicides, 5 algaicides, plant growth regulators, anthelmintics, rodenticides, nematocides, acaricides, amoebicides, protozoacides, fertilizers, crop safeners, fillers and carriers and other adjuvants.

56. An agricultural formulation produced by the method of any one of claims 37 to 40.  
10

57. A method of treatment of a substrate with an active water-insoluble agrochemical principal comprising the following steps:

(i) preparing a formulation comprising at least one active water-insoluble 15 agrochemical principal and at least one dispersant comprising a copolymer wherein said copolymer comprises a residue of a first comonomer and a residue of a second comonomer, wherein said first comonomer is an  $\alpha,\beta$ -unsaturated oxyacid or anhydride and said second comonomer is an olefin having at least one polymerizable double bond and wherein at least one of said first comonomer and 20 said second comonomer is substituted, wherein the substituents for said first comonomer are selected from the group consisting of esters, amides, thioesters and functional groups derived from reaction with nucleophilic reagents and wherein the substituents for the second comonomer are selected from the group consisting of epoxides; sulfonates; esters; amides; and optionally substituted pendent aromatic 25 and heteroaromatic groups wherein said optional substituents are selected from the group consisting of sulfonates, nitrates, phosphates and other substituents derived from reaction with electrophilic reagents;

(ii) dispersing said formulation in an aqueous medium; and  
30

- 66 -

(iii) applying the dispersed formulation to a substrate.

58. A method according to claim 57 wherein the first comonomers are selected from the group consisting of fumaric acid, maleic acid and anhydrides, and the esters, amides  
5 and imides derived from them, itaconic acid and anhydride and the corresponding esters  
amides and imides derived from them, acrylic and methacrylic acids, esters and amides,  
vinylphosphonic acid and the corresponding esters and amides derived from it and  
ethylene sulphonic acid and the esters and amides derived from it.

10 59. A method according to claim 57 wherein the second comonomer is selected from  
the group consisting of  $\beta$ -pinene, 5-ethylidene-2-norbornene, methylene cyclohexane and  
methylene cyclopentane.

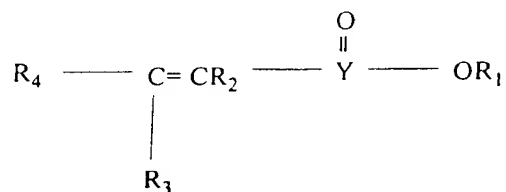
60. A method according to claim 57 wherein the second comonomer is selected from  
15 the group consisting of substituted and unsubstituted norbornene, cyclopentadiene and  
substituted cyclopentadienes, substituted and unsubstituted dicyclopentadienes ,  
cyclohexenes, furans and indenenes.

61. A method according to claim 57 wherein the second comonomer is selected from  
20 the group consisting of limonene and similar terpenes, vinyl cyclohexanes, vinyl  
cyclohexenes, vinyl pyridines, vinyl thiophenes, vinyl naphthalenes, vinyl furans, vinyl  
pyrans and, vinyl pyrrolidones.

62. A method according to claim 57 wherein the second comonomer is an  $\alpha$ -olefin  
25 having an alkyl group selected from the group consisting of diisobutylene, isobutylene, n-  
octene, n-decene, allylglycidylether or vinylisobutylether.

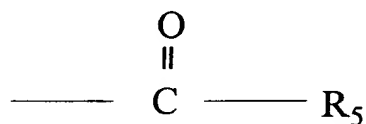
63. A method according to claim 57 wherein the first comonomer has a structure I

- 67 -



I

wherein  $\text{R}_1$  is a metal, quaternary ammonium, phosphonium or sulphonium residue,  $\text{R}_2$  is hydrogen or  $\text{C}_1$  to  $\text{C}_4$  alkyl, Y is a carbon atom,  $\text{O}=\text{S}$ , or  $\text{POR}$  where R is a hydrogen atom or alkyl radical having from 1 to 10 carbon atoms (or carboxylated such radical) and  $\text{R}_4$  is H, an alkyl radical or a carboxylic acid derivative of formula II



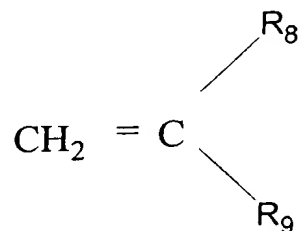
II

wherein  $\text{R}_5$  is  $\text{OR}_6$ ,  $\text{NR}_6\text{R}_7$ ,  $\text{SR}_6$ ,

wherein  $\text{R}_6$  and  $\text{R}_7$  are H, alkyl, O-alkyl, or alkyl groups with a hetero atom substituent.

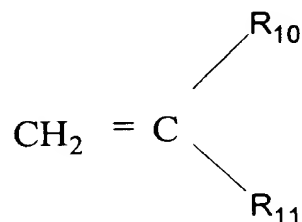
- 68 -

64. A method according to claim 57 wherein the second comonomer has a structure III



III

5 wherein  $\text{R}_8$  represents hydrogen, a straight or branched chain alkyl of from 1-4 carbon atoms,  $\text{R}_9$  represents hydrogen, a branched chain alkyl radical of from 1-12 carbon atoms, or a cycloalkyl radical, and/or a vinyl compound of formula IV

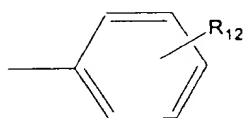


IV

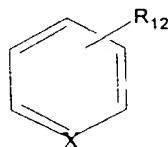
10

wherein  $\text{R}_{10}$  is a straight or branched chain alkyl radical of from 1-4 carbons and  $\text{R}_{11}$  is given by formula V, VI or VII,

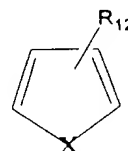
15



V

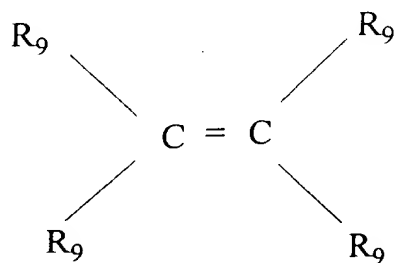


VI



VII

- 70 -

**X**

where  $R_9$  is the same or different and as hereinabove defined.

5

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/AU 98/00855

## A. CLASSIFICATION OF SUBJECT MATTER

Int Cl<sup>6</sup>: A01N 25/30; B01F 17/52

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A01N 25/30; B01F 17/52

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPAT: copolymer: or polymer: or resin:

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU 57541/86 A (ATLANTIC RICHFIELD COMPANY) 8 January 1987 whole document, particularly page 5 line 24	1,2,5,8
X	EP 592169 A (ROHM AND HAAS COMPANY) 13 April 1994 whole document, particularly page 2 line 45	1,2,5,8
X	EP 608845 A (NATIONAL STARCH AND CHEMICAL INVESTMENT HOLDING CORPORATION) 3 August 1994 whole document, particularly page 4 line 49	1,2,5,8
X	EP 364922 A (MITSUBISHI PAPER MILLS, LTD) 25 April 1990 whole document	1,2,6,8,65,66,70,72

☒ Further documents are listed in the  
continuation of Box C

☒ See patent family annex

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search  
26 November 1998

Date of mailing of the international search report

10 DEC 1998

Name and mailing address of the ISA/AU  
AUSTRALIAN PATENT OFFICE  
PO BOX 200  
WODEN ACT 2606  
AUSTRALIA  
Facsimile No.: (02) 6285 3929

Authorized officer

GAYE HOROBIN

Telephone No.: (02) 6283 2069

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU 98/00855

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU 80944/87 A (NIPPON SHOKUBAI KAGAKU KOGYO CO, LTD) 12 May 1988 whole document, particularly page 8 line 28	1,2,6,8,65,66,70,72
X	DE 19641297 A (ROHN AND HAAS CO) 10 April 1997 whole document, particularly column 3 line 50	1,2,4,8,65,66,68,72
X	EP 402563 A (SIKA AG) 19 December 1990 whole document, particularly page 2 lines 50-55	1,2,5,8
X	WO 96/00251 A (THE DOW CHEMICAL COMPANY) 4 January 1996 whole document	1,2,9,10,11,12,19,20,21, 22,25,26,27,28,30,3 5,42,43,44,48- 50,51,65,66,73-76,79- 82
X	EP 357149 A (THE DOW CHEMICAL COMPANY) 1 September 1988 whole document	1,2,9-12,19-22,25- 28,30,35,42-44,48- 51,65,66,73-76,79-82
X	WO 96/37101 A (KEMIRA AGRO OY) 28 November 1996 whole document	1,2,9-12,19-22,25- 28,30,35,42-44,48- 51,65,66,73-76,79-82
X	Patent Abstracts of Japan, C-192, page 95, JP 58-131903 A (DAIICHI KOGYO SEIYAKU KK) 6 August 1983 Abstract	1,2,6,9-12,19-22,25- 28,30,35,42-44,48- 51,65,66,73-76,79-82
X	Derwent Abstract Accession No: 55707E/27, Class A60, E12, G02 (G03), JP 57084730 A (NIPPON OILS AND FATS KK) 27 February 1982 Abstract	1,2,6



# INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU 98/00855

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 7, 17, 40, 71  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  
In Formula I "R<sub>3</sub>" has not been defined, nor has it been defined in the corresponding sections of the description. These claims are thus too imprecise for any meaningful search to be carried out.
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

## Information on patent family members

International application No.  
PCT/AU 98/00855

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member			
✓ AU	57541/86	US	4698161	JP	62001746	
✓ EP	592169	AU	48785/93	CA	2107410	CN 1086233
		JP	6115930	NZ	248855	
✓ EP	608845	AU	53978/94	AU	52336/96	CA 2119998
		EP	869169	EP	875553	EP 878446
		EP	879793	JP	6315622	JP 9052040
✓ EP	364922	AU	42886/89	US	5068067	JP 2187387
		JP	2111428	JP	2303532	JP 2303533
✓ AU	80944/87	CA	1312987	US	4818783	US 4892902
		JP	1028215	JP	63233013	JP 63233012
		JP	63233014	JP	63248718	JP 63233011
✓ DE	19641297	CA	2186831			
✓ EP	402563	AU	55142/90	BR	9002288	CA 2016824
		JP	3035007	NO	901800	NZ 233048
		PT	94059	US	5100984	
✓ WO	96/00251	AU	73571/94	CN	1159199	EP 766705
		US	5693716	US	5753766	AU 64854/94
		CA	2127199	CZ	9401613	EP 631786
		HR	940381	HU	67225	JP 7145076
		NO	942367	PL	304061	SK 798/94
		ZA	9404522	US	5597800	US 5520912
						Continued

Patent Document Cited in Search Report				Patent Family Member			
✓ EP	357149	AU	40827/89	BR	8904400	DK	4324/89
		FI	894089	JP	2167201	US	5508035
✓ WO	96/37101	AU	56954/96				